# The MINING CONGRESS JOURNAL

*Volume 14* DECEMBER, 1928 *No. 12*

## In This Issue

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The Copper Industry Since the War
Safety Work in the Globe-Miami District

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Stripping Problems on the Mesaba Range
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Application of Caving Methods to Small Ore Bodies

Correlation of the Coals of Western Kentucky, Southeastern Illinois and Southwestern Indiana

Relation of Float and Sink Tests to Coal Washing
Physical Examination in Bituminous Coal Mining

Legislative Review
Mechanization Reports

**Contributors:**

*Wm. G. Schneider, Edward W. Parker, C. W. Hare, S. A. Taylor, C. W. Huntress, Dr. Walter F. Rittman, Gustav Egloff, F. H. Holladay, Rush T. Sill, A. H. Shoemaker, Willard R. Jillson, A. H. Cole, George Fordham, G. B. Southward.*

Practical discussions, by successful men of the most interesting and pertinent topics before the mining industry today—that is the program of the annual convention of The American Mining Congress appearing on another page of this journal. From international mining to the work of the recently organized national committee on mechanized mining; from taxation and other problems of the metal miner to coal's relation to the public and its new competitors; from the legislative prospect to strategic war minerals. Such, briefly, outlines the scope of the program of this important meeting. This material will appear in following issues of

The MINING CONGRESS JOURNAL

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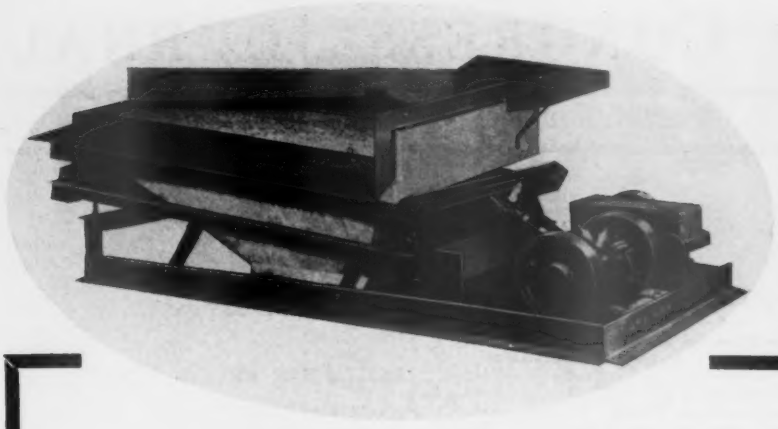
# VAMPIRE

## BOOK 2

XV



# Such Distinction Must be Merited!

**Thirty-six coal producers in recent months have placed contracts with us for RandS Cleaning Plants: some dry cleaning plants using the Arms Air Concentrator—some wet process plants using the Menzies Hydro Separator—and some combination plants using both processes.**

**These typical users scattered throughout the United States, Canada and England are real testimonials to the merits of the RandS Method of coal cleaning and they, like many other operators, are depending more and more on RandS Engineers to furnish the most economical and practical equipment so necessary today for the competitive production of coals.**

**RECENT INSTALLATIONS**

| *Name of Company and Plant Location* | *Name of Company and Plant Location* |
|---|---|
| BERWIND-WHITE COAL MINING CO., Windber, Pa., No. 37 Mine. | LYNCHBURG COAL AND COKE CO., Kyle, W. Va. |
| ALGOMA COAL AND COKE CO., Algoma, W. Va. | BRADSHAW COAL CO., Dan, W. Va. |
| GULF SMOKELESS COAL CO., Covel, W. Va. | *CLINCHFIELD COAL CORPORATION, Dante, Va. |
| GULF SMOKELESS COAL CO., Tams, W. Va. | *HILLMAN COAL AND COKE CO., Jerome, Pa. |
| GULF SMOKELESS COAL CO., Hotcoal, W. Va. | KOPPERS COAL CO., Maitland, W. Va. |
| BRAZEAU COLLIERIES, LTD., Nordegg, Alta., Can. | POCAHONTAS FUEL CO., Freeman, W. Va., Caswell Creek Mine. |
| ELK RIVER COAL & LUMBER CO., Widen, W. Va. | COLLIER DUNLAP COAL CO., Clarksville, Ark. |
| AYRSHIRE COAL CO., Oakland City, Ind. | CARNEGIE STEEL CO., Clairton, Pa., by-product plant. |
| WINDING GULF COLLIERY CO., Winding Gulf, W. Va., No. 2 Mine. | MILL CREEK COAL & COKE CO., Coopers, W. Va. |
| WINDING GULF COLLIERY CO., Winding Gulf, W. Va., Mistletoe Mine. | POCAHONTAS FUEL CO., Vivian, W. Va., Bottom Creek Mine. |
| WINDING GULF COLLIERY CO., Winding Gulf, W. Va., No. 1 Mine. | AMERICAN COAL CO. OF ALLEGANY COUNTY, Pinnacle Mine. |
| ASHINGTON COAL CO., LTD., Ashington, Northumberland, England. | KILLARNEY SMOKELESS COAL CO., Killarney, W. Va. |
| *BERWIND-WHITE COAL MINING CO., Windber, Pa., No. 40 Mine. | PRICE HILL COLLIERY CO., Price Hill, W. Va. |
| PITTSBURGH COAL CO., Library, Pa., Montour No. 10 | MARION COUNTY COAL CO., Centralia, Ill. |
| PAGE COAL AND COKE CO., Pageton, W. Va. | POCAHONTAS FUEL CO., Pocahontas, Va., Baby West Mine. |
| UPLAND COAL AND COKE CO., Elkhorn, W. Va | *POCAHONTAS FUEL CO., Cherokee Mine, Ashland, W. Va. |
| CROZER COAL AND COKE CO., Elkhorn, W. Va. | C. C. B. SMOKELESS COAL CO., Mount Hope, W. Va. |
| PEERLESS COAL AND COKE CO., Vivian, W. Va. | |
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*Now under construction (October, 1928).

*The RandS Method of Coal Cleaning is completely presented in the recently published Bulletin No. 110. Send for a copy.*

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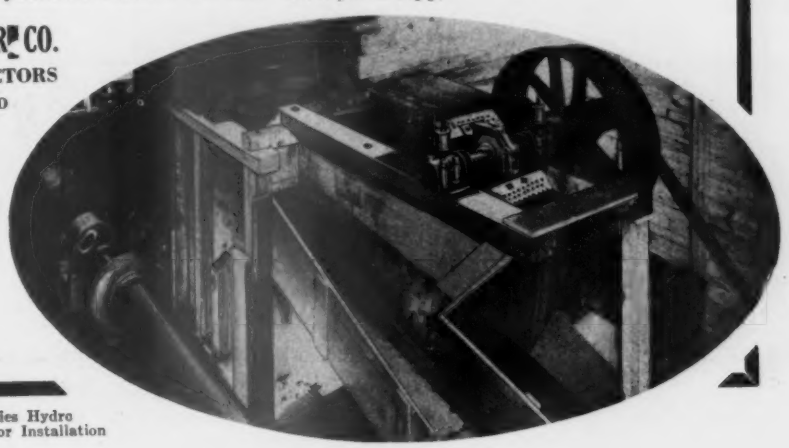

A Menzies Hydro Separator Installation

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*Unwatering the Red Cloud Shaft*

*The Application of Caving Methods to Small Ore Bodies at Old Dominion*

**COAL**

*A Correlation of the Coals of Western Kentucky, Southeastern Illinois, and Southwestern Indiana*

*Relation of Float and Sink Tests to Practical Coal Washing*

*Physical Examination in Bituminous Coal Mining*


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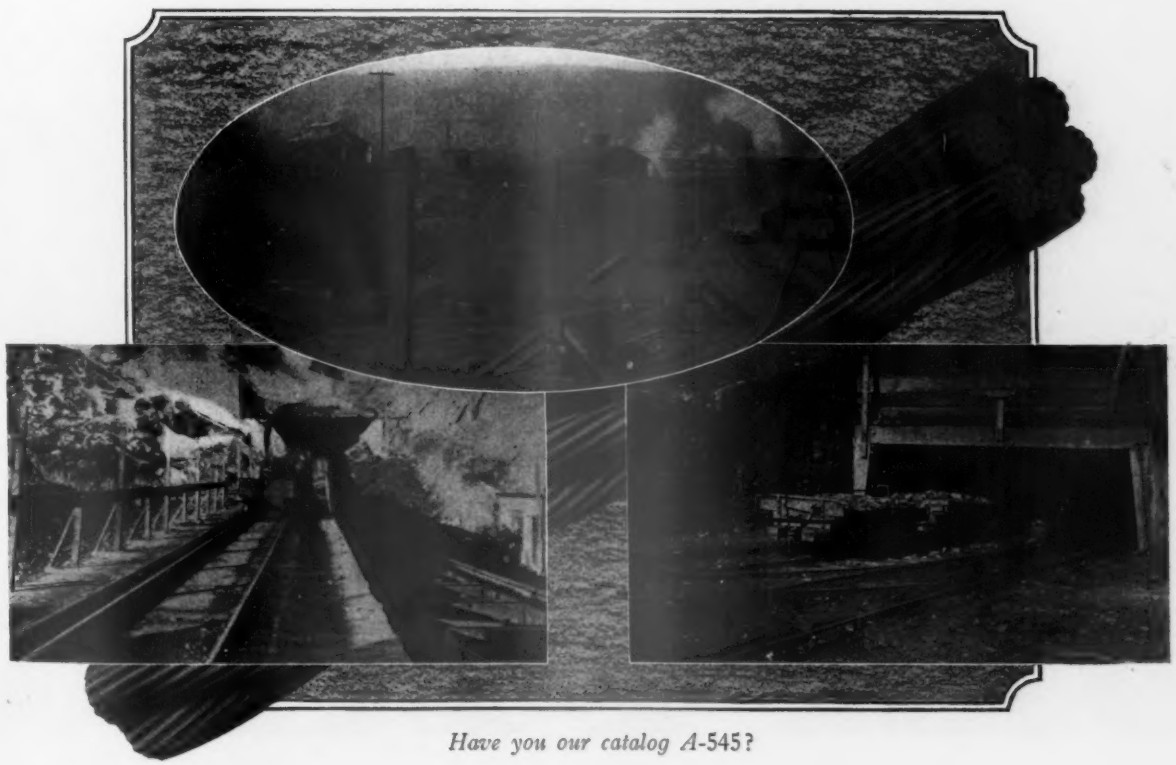

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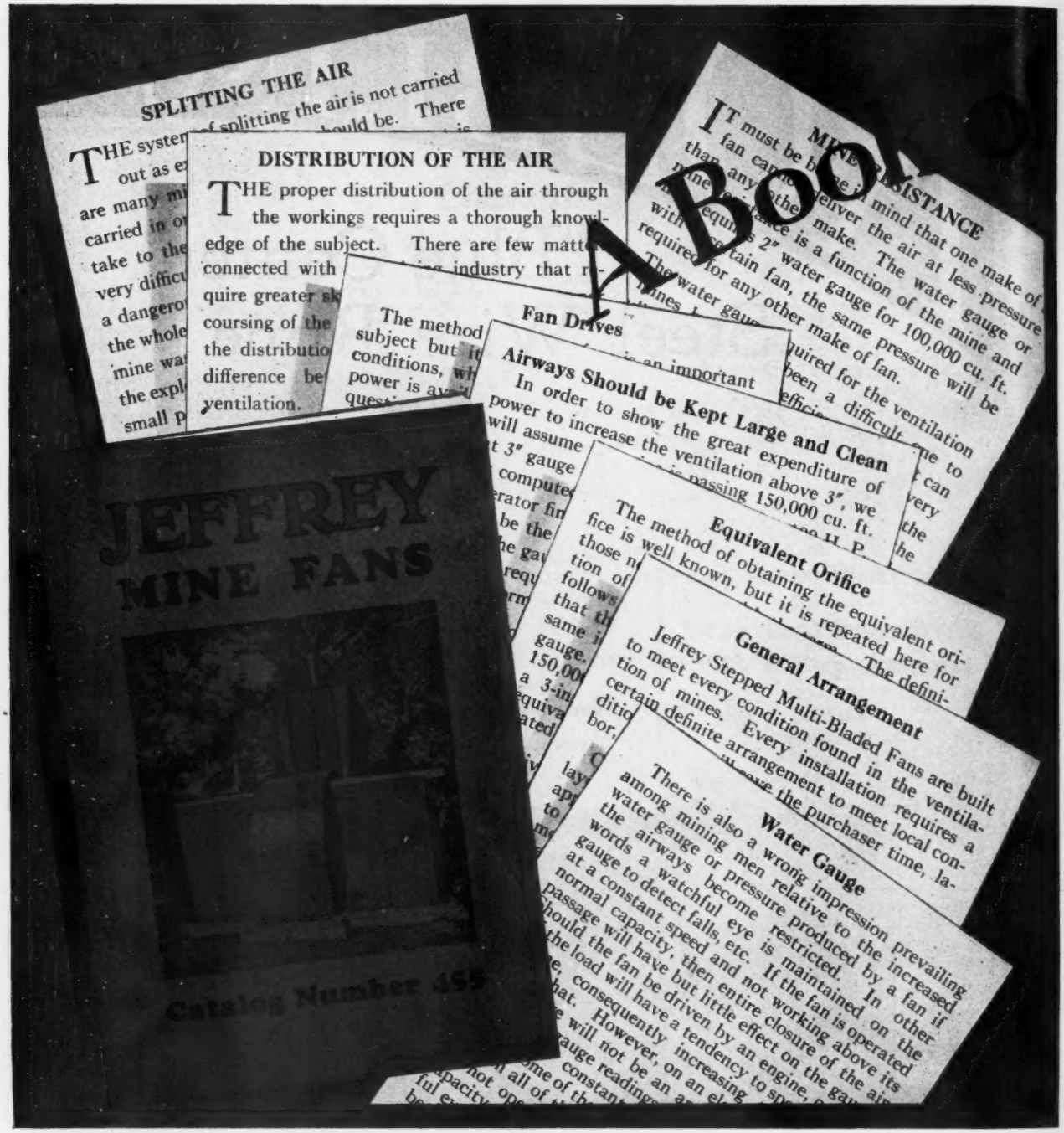


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*Send for your copy of Catalog No. 455-C.*

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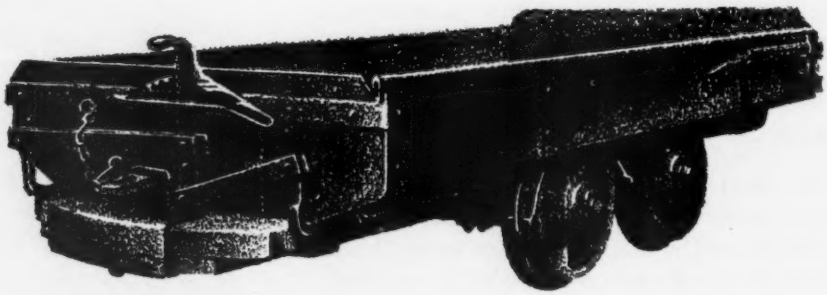
# COAL MINE EQUIPMENT



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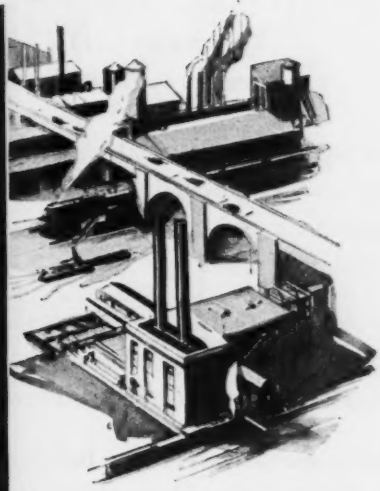
# This sums it up . . .
## *Double the Service for 5% more*



BUT don't you see, when you tell me that one kind of pipe costs fifty per cent more, or five hundred per cent more than another, you haven't really said anything? If I tell my tailor to put a better set of buttons on a suit of clothes, the buttons might cost double, but the suit won't. Pipe in the stock pile doesn't interest us, Burnham. What interests us is a heating or power system. When we get them installed, what are they going to cost? Compare good wrought iron with the cheapest pipe you can buy; and see what difference there is in the systems *installed.*

*Why, if that's your comparison, Mr. Pike, of course there's a lot besides pipe to be considered. Labor, fittings, and incidentals, and a proper charge for overhead will account for nine-tenths of our estimate. The extra cost of pipe would be a very small percentage of your whole installation.*

That's exactly what I mean, Burnham. Suppose the cheapest pipe costs 5% and the best pipe costs 10% of your pipe system. That means that you're getting a better, more lasting system for about 5% difference in cost, doesn't it?

*About that, yes.*

And your better installation will last twice to three times as long?

*At least twice, the engineers tell us.*

Then where's the hitch?

*Well, after all, Mr. Pike, five hundred dollars is five hundred dollars; and you told us to pare down wherever we could.*

Let's not be stingy where the consequent loss will be so great compared with the immediate saving. We're pretty poor salesmen if we can't justify this extra five hundred dollars for a thing that will be doing service as long as the building stands. Make it genuine wrought iron, preferably Byers. Tell 'em to show the manufacturer's mark on every length. I'll take the responsibility.

*Very well, Mr. Pike, I assure you nothing could suit me better. I just didn't know how you'd feel. Byers suits me.*

* * * * *

IF you are going to build, whether it be a home, factory, skyscraper, school or something else, protect your investment in plumbing, heating, power and other pipe systems against the excessive cost of repairs.

For labor and other items do mount up even more seriously when it comes to replacement. Five per cent extra invested in Byers Pipe, at the start, insures a system which will last from two to three times longer.

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Established 1864 Pittsburgh, Pa.

# BYERS PIPE
## GENUINE WROUGHT IRON

# RHEO—Washed Coal

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To the coal industry, this organization offers testing and engineering services and washing equipment devoted to the maximum recovery of *Well-Cleaned Coal.*

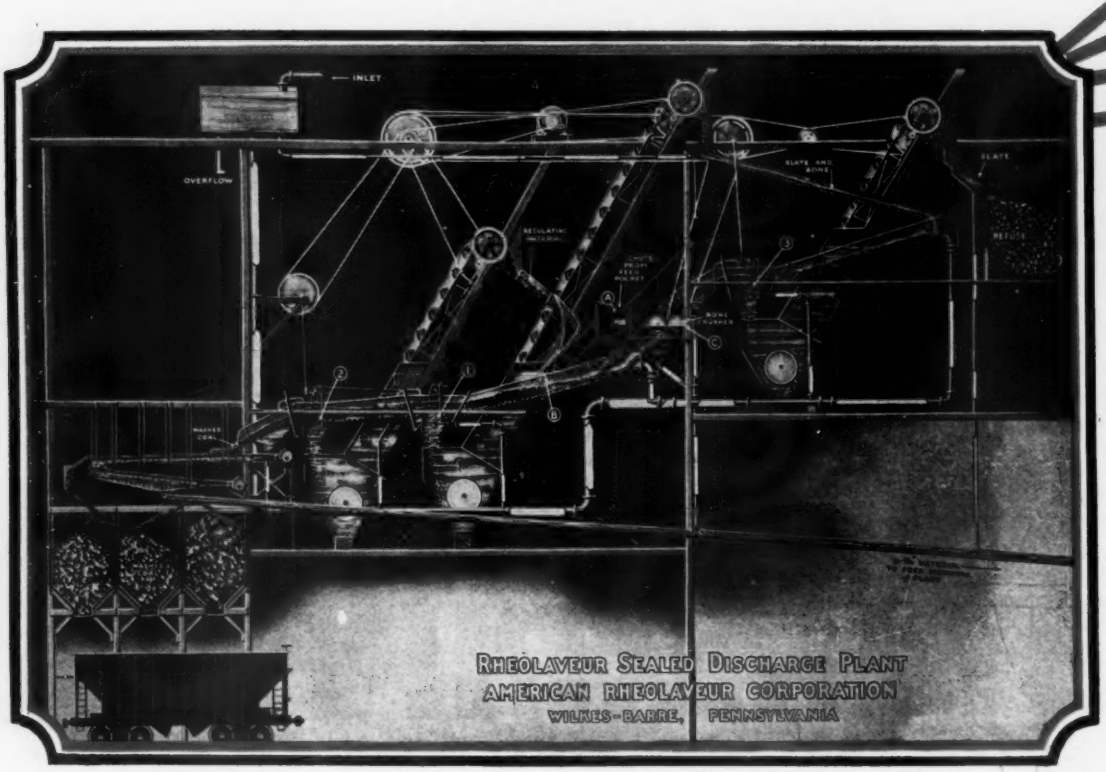
Rheo Equipped Plants are making money because Rheo-Cleaned Coal quickly wins and holds both dealer and consumer preference.

There are now over two hundred Rheolaveur Plants in operation throughout the world, with an annual capacity of nearly 70,000,000 tons.

Rheolaveur Plants in operation in the United States by the end of 1927 totalled ten with an annual capacity of 3,545,000 tons. During 1928, three new installations and an addition to an existing plant were made, adding 7,000,000 tons of annual capacity and giving a total annual capacity of nearly 11,000,000 tons by January 1st, 1929.

Such a record of accomplishment has only been possible because the special advantages of the Rheolaveur process produce a more marketable grade of coal and do it *at a substantial saving.*

On the opposite page note what Rheolaveur Equipment is doing at the plants of four typical American operators.



# Cuts cleaning costs
# Insures steady mine output
# Brings the best prices

McCoy Washery, Great Valley Anthracite Corp., 1,000 tons per day Rhéolaveur Washery. Cleans 3½x3/16 in. coal to 2% lower ash than formerly thought possible.

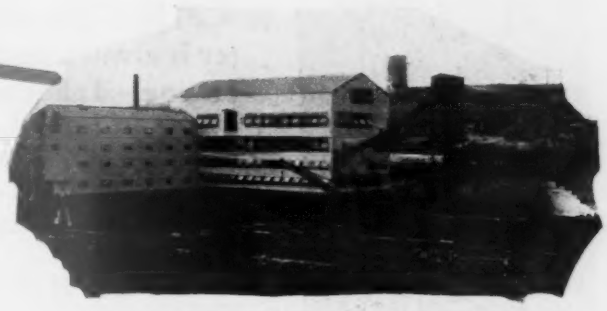
Hazleton Shaft Breaker, Lehigh Valley Coal Co. Here the Rhéolaveur System washers in two operations, egg, stove, nut, pea, buck, rice and barley sizes of anthracite coal. Much of output is shipped as "special."

The first cost of plant only 2/3 of equivalent jig breaker cost.

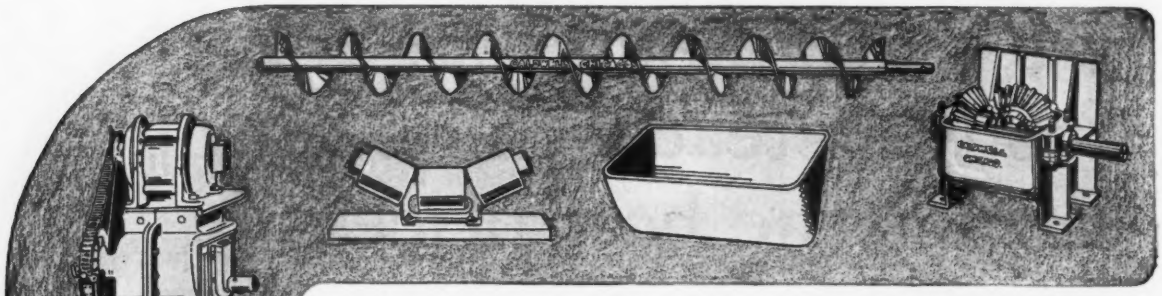
Refuse contains less than 1/3 as much coal as former jig refuse after it was in addition hand picked.

Only 3 men required to operate Rhéolaveur plant.

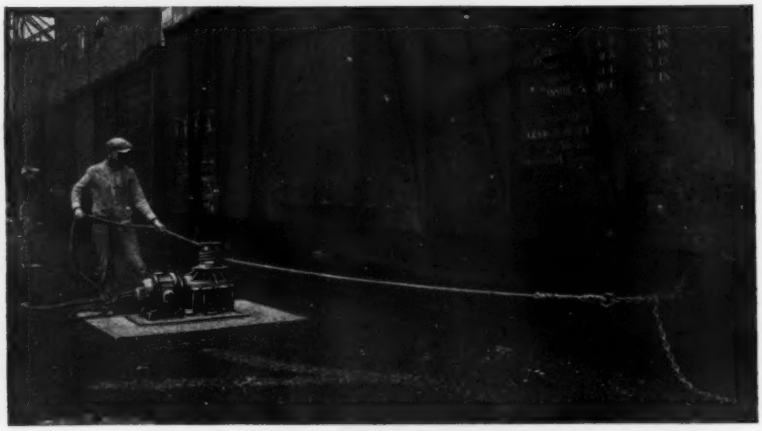
New Black Diamond Washery, Pacific Coast Coal Co. Lump over 4-in. Hand-picked; 1,000 tons per day, minus 4 in. washed by Rhéolaveur.. Washed coal consistently low in ash and pleases most critical market.



Champion Washery, Pittsburgh Coal Company, Handles the output of six mines. Lump over 4 in. Hand-picked; 10,000 tons per day minus 4-in. washed by Rhéolaveur. Fine coal dried with the Carpenter Driers and filters so that the product will be dry as well as clean. A uniform product prepared and sold on a quality basis.



# How do *you* "spot" cars?



LET this rugged, self-contained electric winch spot your cars and do odd "pulling" jobs around the plant. Pulls in any direction.

The Caldwell vertical capstan electric car spotter is always ready—no need to wait for the switch engine. Takes no time at all to spot a car.

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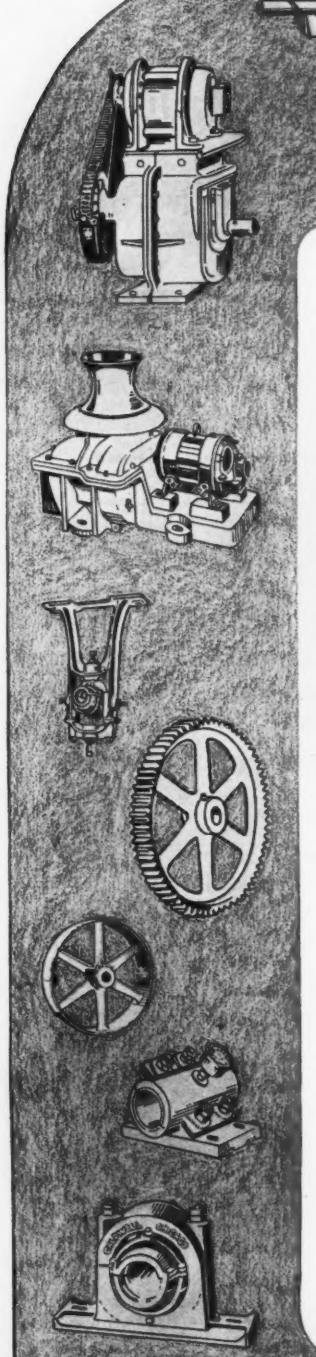

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**Correct Lubrication**
***is Essential***

**Lubrication is no less a tool of production than the highest priced machine in your plant, and the selection of lubricants deserves equally careful consideration.**

**Frequently, to obtain proper lubrication, a careful investigation by experts is necessary. The Standard Technical Staff, working for years between our refineries and varied industries, has become expert in solving lubrication problems and has developed a full line of efficient lubricants for practically every industrial need.**

# The Man who can save *many* dollars for you

**The mining industries are rapidly reaching universal recognition of the importance of the lubrication engineer. The increase in the use of machinery in mining methods has made the subject of lubrication important.**

**So important has lubrication become as a factor in the efficient operation of machinery that it has become a science and a very important branch of the engineering profession. Because specialized knowledge is so essential in providing correct lubrication the Standard Oil Company (Indiana) has developed an efficient corps of lubrication engineers. These men, working with mine superintendents and engineers have saved the mining industries thousands of dollars by improving methods of lubrication.**

**There are Standard Oil Company (Indiana) Lubrication Engineers who thoroughly understand mining conditions and mine lubrication needs. They have at their disposal a complete line of the highest grade lubricants that it is possible to produce. When a Standard Oil Company (Indiana) Lubrication Engineer makes recommendations and the proper Standard Lubricants are used the resulting lubrication is as nearly perfect as lubrication can be.**

**It places you under no obligation when having one of these experts study your lubrication requirements.**

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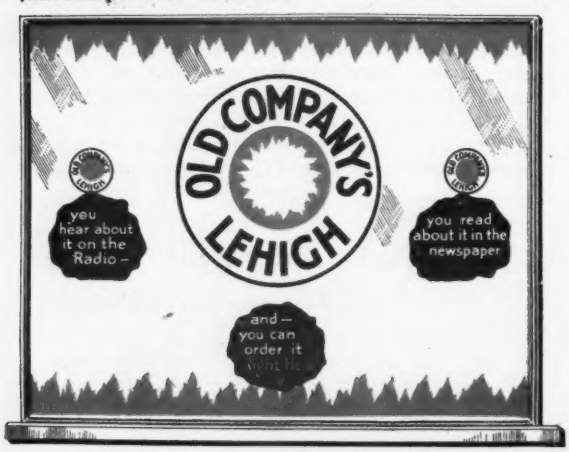


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**New York - Boston - Buffalo - Springfield, Mass.**

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And today the Keystone Lubricating Company's research laboratories have 250 lubricants to their credit. Scientifically correct lubricants, all of them. And each especially designed to perform its specific lubricating task particularly well.

These lubricants are proving a decided economy in the many plants now using them—as countless enthusiastic letters in our files attest.

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KEYSTONE LUBRICATING COMPANY
ESTABLISHED 1884
21st, Clearfield and Lippincott Streets, Philadelphia, Pa.

# KEYSTONE
## LUBRICANTS

KEYSTONE TRADE MARK Reg. U.S. Pat. Off. GREASE

KEYSTONE SAFETY LUBRICATING SYSTEMS

# JOHNSON CAR REPLACERS

LEFT HAND

*In general use by Railroads, Mines and Contractors*

RIGHT HAND

Straddle the rail—need no spikes, clamps or fasteners

Rest on rail both front and rear

Adjust themselves to different heights of rail

Form a friction grip with rail during operation

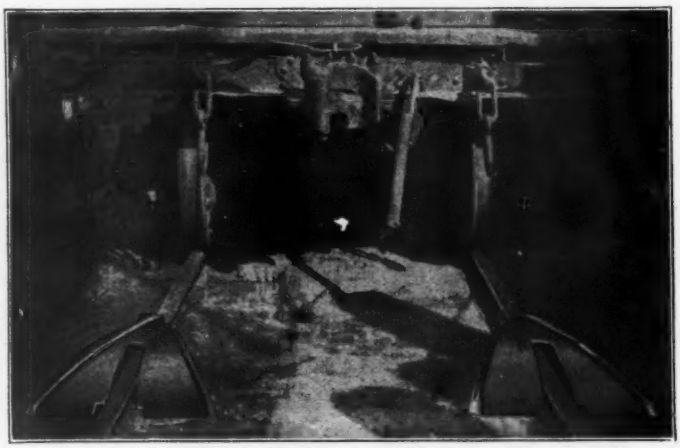
Bring rails to gauge during replacement

Distribute the load on the rail, not one or two ties

Made of open hearth cast steel, properly annealed

| | Range | T-rail | Capacity | Throat opening | Weight each |
|---|---|---|---|---|---|
| Type M | for rail up to 45 lbs. | if not over 3½ in. high | 20 Ton Locomotive | 2 inches | 30 |
| Type C | for rail up to 65 lbs. | if not over 4½ in. high | 30 Ton Locomotive | 2½ inches | 60 |
| Type B | for rail up to 80 lbs. | if not over 5½ in. high | 50 Ton Locomotive | 3¼ inches | 110 |
| Type A | for rail up to 100 lbs. | if not over 5¾ in. high | 80 Ton Locomotive | 3½ inches | 145 |
| Type Z | for rail up to 120 lbs. | if not over 6½ in. high | 100 Ton Locomotive | 3½ inches | 165 |
| Type AA | for rail up to 120 lbs. | if not over 6½ in. high | 200 Ton Wreck Outfit | 3½ inches | 250 |

*Wrecking Frogs*



*Rerailers*

## THE JOHNSON WRECKING FROG CO.

1012 Ulmer Building

Cleveland, Ohio

# Make Profits by Cutting Costs

**Why not face the over-production problem squarely?**

**Profit in coal mining today is a question of saving money. If an oversold market robs you of profits, look to your COSTS.**

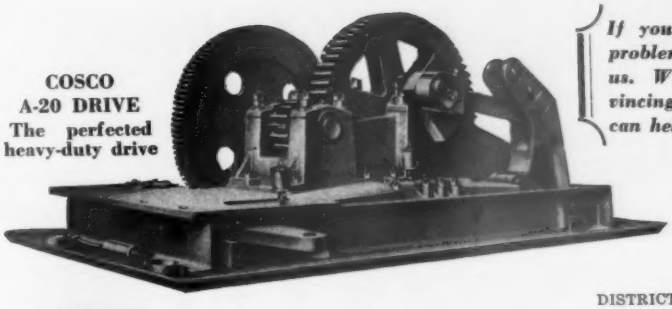
**More than 300 successful COSCO Conveyor Systems in American coal mines are saving money every day for the operators. One operator is now using 47.**

**The COSCO Shaker Conveyor is built from American materials, to American standards, for American conditions. Its first cost is low. It costs less to maintain than other systems. It is a consistent producer. Its savings are amazing. It operates successfully under conditions impossible for any other mechanical conveyor system.**

**The COSCO A-20 and B-15 Drives and troughing, equipped with improved flanged rollers have solved the coal-handling problem for hundreds of American mines. Our experience and specialization in this field equips us to suggest the best system for your particular requirements.**

COSCO

Shaker CONVEYOR



**COSCO A-20 DRIVE**
**The perfected heavy-duty drive**

***If you have a cost problem, a production problem or a man problem in your mines, write us. We'll gladly submit facts, figures and convincing proof of how COSCO Shaker Conveyors can help to solve it.***

**CONVEYOR SALES CO., INC.**
**299 Broadway, New York**

DISTRICT SALES OFFICES

Pittsburgh, Pa., *1538 Montier Street, Wilkinsburg.*
Scranton. Pa., *Mears Building.*
Huntington, W. Va., *1223 Tenth Avenue.*
Knoxville, Tenn., *2725 Magnolia Avenue.*
Salt Lake City, Utah, *Salt Lake Hardware Co.*
Denver. Colo., *Stearns Roger Mfg. Co.*
Pittsburg, Kans., *Railway Exchange Building.*
Chicago, Ill., *224 South Michigan Avenue.*

***"Convey Your Coal the Cosco Way"***

TO THOSE WHO SAY ' ' '

# "Why Change Explosives?"

WHEN the work is running smoothly; when the men are familiar and satisfied with a powder, many a superintendent or buyer asks: "Why change explosives?" It's natural not to want to change, but progress must keep pace with improvement.

The Hercomites represent one of the greatest explosives values ever offered. Where they are suitable, 70 cents' to 90 cents' worth of Hercomites are successfully replacing 1 dollar's worth of Extra or Gelatin dynamite.

Sooner or later, many who now cling to the old familiar Extras, Specials and Gelatins will change to the Hercomites, to lower their blasting costs. Don't be among the last to benefit from the savings they effect. Write us for a descriptive booklet and investigate now.

*For information on other explosives and blasting supplies, see pages 170 to 172 of the 1928 Keystone Metal Quarry Catalogue.*

## HERCULES POWDER COMPANY

Wilmington, Delaware

*Sales Offices:* Allentown, Pa., Birmingham, Buffalo, Chattanooga, Chicago, Denver, Duluth, Hazleton, Pa., Huntington, W. Va., Joplin, Mo., Los Angeles, Louisville, New York City, Norristown, Pa., Pittsburg, Kan., Pittsburgh, Pottsville, Pa., St. Louis, Salt Lake City, San Francisco, Wilkes-Barre, Wilmington, Del.

Hercules Powder Company, Inc.
934 King Street, Wilmington, Delaware
Please send me additional information regarding the new Hercomites, No. 2 to No. 7.

Name .....

Company ..... Street .....

City ..... State .....

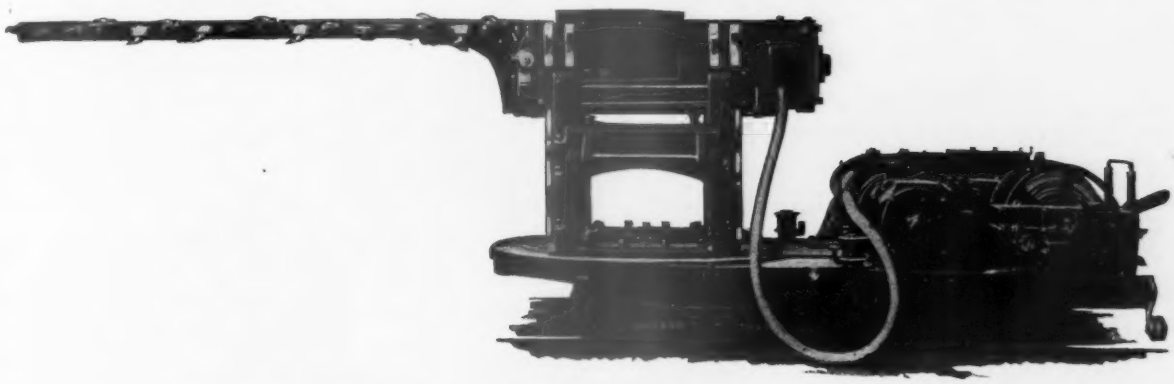
2282

# A thick rock parting removed—

A 50-hp. Goodman Slabber fairly buried. Where the rock and rash of a thick parting fall loosely into the kerf, or are broken by shooting, the entire mass is swept out by reverse swing of the cutter arm. This reverse swing is made instantly and as often as desired, by simple reversal of the motor at the controller—no ropes or jacks to reset. "The swing is GEARED."

12 to 40 in. of rock removed. The Goodman Slabber enables The Consolidation Coal Co., Jenkins, Ky., to recover in their No. 205 Mine, a large area of coal which formerly had been abandoned. The slabber enters a place and cuts just above the rock, then the rock is shot up, and the machine returns and sweeps or rakes out the broken rock.

## —by the GOODMAN SLABBER



## Built to "Stand the Gaff"

*Book No. 280, describing 3 types, sent on request* (92)

**GOODMAN** MANUFACTURING COMPANY
HALSTED ST. at 48TH.
CHICAGO - - - ILL.

**Locomotives - Loaders - Coal Cutters**

PITTSBURGH—HUNTINGTON, W.VA.—CINCINNATI—BIRMINGHAM—ST. LOUIS—DENVER—PRICE, UTAH

# Increasing the sale and uses of Copper

SEVEN years ago the leading American producers and fabricators of copper organized the Copper and Brass Research Association. Its function was to regain markets lost when Copper was withdrawn from the field of commerce during the war, and to find new fields for its uses.

During the seven years of its existence, the Association has formed contact with approximately 100,000 plumbing contractors, sheet-metal workers and other handlers and users of Copper, Brass and Bronze.

It has conducted research into scores of consuming industries and has, in co-operation with its member companies, worked out many technical problems having to do with the proper application and uses of Copper and its principal alloys, Brass and Bronze.

It has published millions of advertising messages in the leading national magazines, daily newspapers and the trade and technical press.

The Association invites individuals and companies to bring to it any technical questions concerning these metals with which they are confronted.

## MEMBER COMPANIES

### MINING

**The American Metal Co., Ltd.**, 61 Broadway, New York
**American Smelting & Refining Co.** 120 Broadway, New York
**Anaconda Copper Mining Co.** 25 Broadway, New York
**Arizona Commercial Mining Co.** 50 Congress St., Boston, Mass.
**Braden Copper Company** 120 Broadway, New York
**Calumet & Arizona Mining Co.** Calumet, Mich.
**Calumet & Hecla Consol. Copper Co.** 12 Ashburton Pl., Boston, Mass.
**Chile Exploration Company** 25 Broadway, New York
**Greene Cananea Copper Co.** 25 Broadway, New York
**Inspiration Consolidated Copper Co.** 25 Broadway, New York
**Isle Royale Copper Company** 12 Ashburton Pl., Boston, Mass.
**Kennecott Copper Corporation** 120 Broadway, New York
**Magma Copper Company** 14 Wall St., New York
**Miami Copper Company** 61 Broadway, New York
**Mother Lode Coalition Mines Co.** 120 Broadway, New York
**Nevada Consolidated Copper Co.** 25 Broad Street, New York
**New Cornelia Copper Company** Calumet, Mich.
**Nichols Copper Company** 25 Broad Street, New York
**Old Dominion Company** 99 John St., New York
**Phelps Dodge Corporation** 99 John St., New York
**Ray Consolidated Copper Co.** 25 Broad St., New York
**Shattuck Denn Mining Corporation** 120 Broadway, New York
**United Verde Copper Company** 111 Broadway, New York
**United Verde Extension Mining Co.** 233 Broadway, New York
**Utah Copper Company** 25 Broad St., New York
**White Pine Copper Company** 2 Ashburton Pl., Boston, Mass.

## MEMBER COMPANIES

### FABRICATING AND DISTRIBUTING

**The American Brass Company** General Offices, Waterbury, Conn.
**American Smelting & Refining Co.** 120 Broadway, New York
**Anaconda Copper Mining Company** 25 Broadway, New York
**Bridgeport Brass Company** East Main St., Bridgeport, Conn.
**Chase Brass & Copper Co., Inc.** Waterbury, Conn.
**T. E. Conklin Brass & Copper Co., Inc.** 54 Lafayette St., New York
**Dallas Brass & Copper Co.** 820 Orleans St., Chicago, Ill.
**Foster Wheeler Corp.** 165 Broadway, New York
**C. G. Hussey & Company** 2850 Second Ave., Pittsburgh, Pa.
**Mueller Company** Decatur, Ill.
**The National Brass & Copper Co.** Lisbon, Ohio
**New England Brass Company** Park St., Taunton, Mass.
**The New Haven Copper Company** Seymour, Conn.
**The New Jersey Wire Cloth Company** Trenton, N. J.
**The J. M. & L. A. Osborn Company** 1541-51 East 38th St., Cleveland, O.
**The Paper and Textile Machinery Co.** Sandusky, Ohio.
**Rome Brass & Copper Company** Dominick & Bouck Sts., Rome, N. Y.
**Scovill Manufacturing Company** Waterbury, Conn.
**Taunton-New Bedford Copper Co.** 267 West Water St., Taunton, Mass.
**Wolverine Tube Co.** 1411 Central Ave., Detroit, Mich.

William A. Corey
MANAGER

**COPPER & BRASS**
RESEARCH ASSOCIATION
25 Broadway, New York

*Midwestern Office*
Landreth Building
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*Canadian Office*
67 Yonge St.
Toronto, Ont.

*Pacific Coast Office*
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Los Angeles, Calif.

Elevating Chains and Buckets of every description

"800" Class Chain | "C" Class Combination Chain | "400" Class Chain | "RC" Class Chain for power transmission

Continuous Overlapping Steel Elevator Buckets

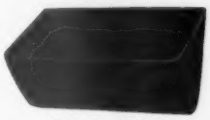
>FLINT-RIM< Sprocket

Gears of all kinds

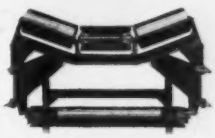
## From Our Pacific Coast Stock And on to the Job—

THAT'S the kind of service we can offer you because of large stocks on the Pacific Coast of Elevating, Conveying and Power Transmission Equipment.

Popular sizes in Chains, Clutches, Pulleys, Bearings, Buckets, Gears, Sprockets, Shafting—these are carried in stock at our warehouses. Send for Catalog.

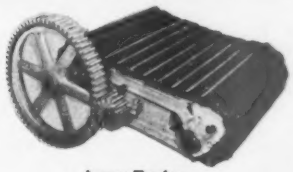


Elevator Buckets



Link-Belt Anti-Friction Belt Conveyor Idler

Plain Bearing



Apron Feeder

Pulley

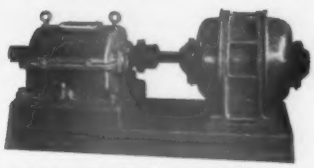
Malleable Iron Safety Collar

>HEXTOP-< Grease Cup

Style "DS" Take-up

Type "C" Flexible Coupling

Meeseco Short-Center Belt Drive



Link-Belt Herringbone Speed Reducer (Sykes tooth form)

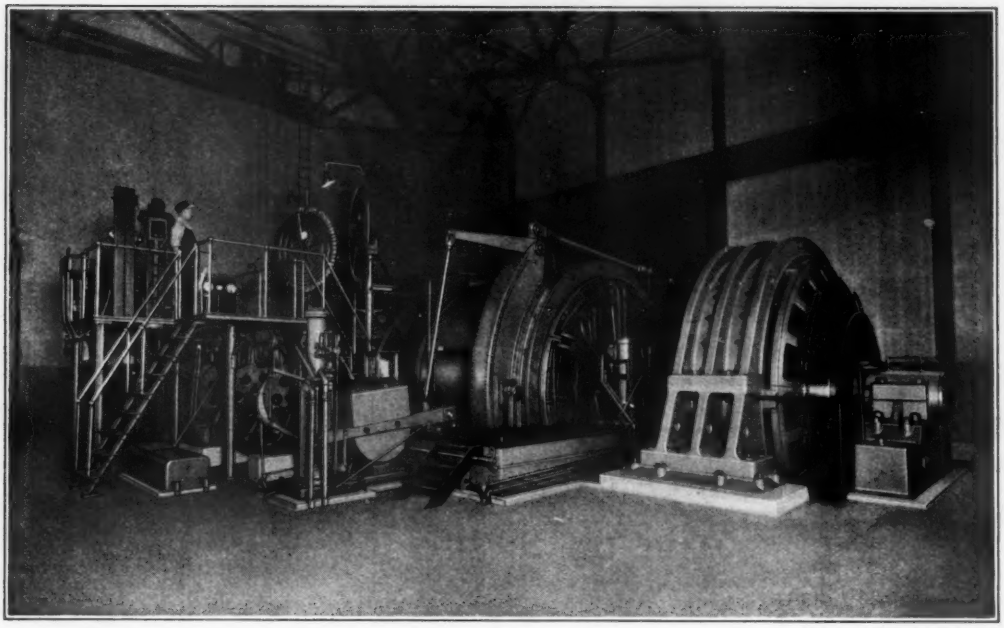
Industry uses Link-Belt Silent Chain Drives for transmitting power "without slip"

3436A

LINK-BELT MEESE & GOTTFRIED COMPANY

San Francisco.....19th and Harrison Sts. Seattle.....820 First Ave. S. Portland, Ore.....67 Front St.
Oakland.....526 Third St. Los Angeles.....361-369 S. Anderson St.

# LINK-BELT



# Allis-Chalmers Hoists
*at*
## The Mountain Consolidated Shaft of Anaconda Copper Mining Company

**PRODUCTS:**

**Mining Machinery**
**Metallurgical Machinery**
**Crushing Machinery**
**Cement Machinery**
**Electrical Machinery**
**Gas Engines**
**Steam Engines**
**Steam Turbines**
**Condensers**
**Oil Engines**
**Hydraulic Turbines**
**Pumping Engines**
**Centrifugal Pumps**
**Flour Mill Machinery**
**Saw Mill Machinery**
**Air Compressors**
**Steam and Electric Hoists**
**Tractors**
**Texrope Drives**

The Ore Hoist at this mine is in successful operation. It is a double drum clutched type coupled to an Allis-Chalmers direct current motor capable of handling a peak load of 4300 H.P. at acceleration. Variable voltage system of control is employed with Allis-Chalmers synchronous motor-generator set and switchboard equipment.

This Hoist handles seven tons of ore per trip at a speed of 2250 ft. per minute and is designed to hoist from a depth of 5000 ft. It is arranged so that it can be operated, if desired, automatically from the underground loading pocket. It has been successfully run under automatic operation from the 3000 ft. level.

The Chippy or material hoist with 1000 H.P. direct connected D. C. motor with synchronous motor-generator set at this mine is also an Allis-Chalmers unit.

***Our Engineering Advice and Information Pertaining to Any Hoisting Problem is at Your Service***

# ALLIS-CHALMERS
MILWAUKEE, WIS. U. S. A.

# A PERMISSIBLE FOR MINES USING BLACK-POWDER

IN coal that has always been considered too soft for permissibles, Hercoal-F is now doing the work of Black Blasting or Pellet Powder without increasing the cost.

Volume for volume, this new permissible is equal in strength to Black Blasting or Pellet Powder, and it costs no more. The smoke, fumes and water-resisting qualities of Hercoal-F are far superior to those of either Black Blasting or Pellet Powder. It is not highly inflammable, and it produces good lump.

In Hercoal-F you can at last get an explosive similar in action to Black Powder with all the advantages of a permissible in safety, convenience and ease of handling.

Write for descriptive booklet.

*A comparison of* **HERCOAL-F** *with Blasting & Pellet Powder*

**COUNT**—*About 500 Cartridges (1¼ x 8) per 100 lbs.*

**SAFETY**—*Hercoal-F is a permissible explosive*

**STRENGTH**—*The Same*

**FUMES**—*Much Better*

**COST**—*No more*

*HERCULES POWDER COMPANY*
*(INCORPORATED)*
Wilmington, Delaware

*Sales Offices:* ~ Allentown, Pa., Birmingham, Buffalo, Chattanooga, Chicago, Denver, Duluth, Hazleton, Pa., Huntington, W. Va., Joplin, Mo., Los Angeles, Louisville, New York City, Norristown, Pa., Pittsburg, Kan., Pittsburgh, Pottsville, Pa., St. Louis, Salt Lake City, San Francisco, Wilkes-Barre.

*For further information on other explosives and blasting supplies, see pages 712 and 713 of the 1927 Keystone Coal Mining Catalog.*

Hercules Powder Company, Inc.
934 King Street, Wilmington, Delaware
Please send me booklet describing Hercoal-F.

Name ..... Company .....
Street ..... City ..... State .....
2451

# Copper Steel
## adds years of service

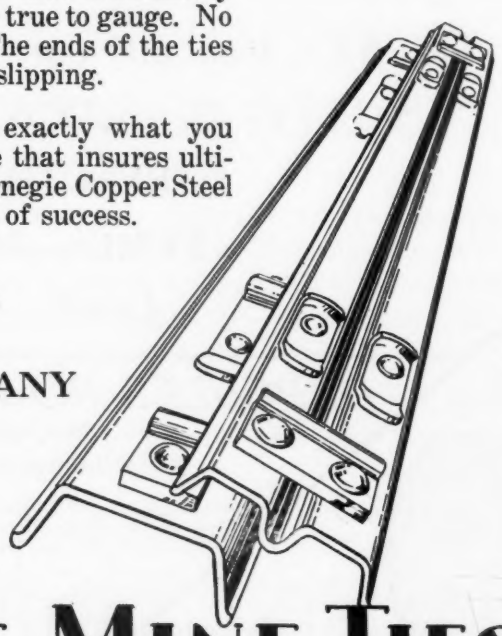
In coal mines where floors are damp, the life of wood ties is exceedingly short. They soon rot and decay. Very dry floors are also destructive, causing dry rot. Ordinary steel ties last for a longer period under these adverse conditions, but corrosion finally ends their usefulness.

Carnegie Mine Ties are made of Copper Steel. Copper resists rust and when added to steel, greatly retards corrosion. Thus a much longer life is assured than ordinary steel ties can give—extra service without additional cost to you.

Aside from their economy through exceedingly long service, Carnegie Ties recommend themselves to users for many other reasons. They are light and portable. Their shallow depth saves headroom. They are made in a number of styles with single or double locking clips as you may prefer. The clips are riveted to the tie and cannot get lost. A hammer blow is all that is necessary to firmly secure the rail, automatically true to gauge. No special tools or fittings are needed. The ends of the ties may be crimped if desired, to prevent slipping.

We have endeavored to give you exactly what you want—an efficient mine tie at a price that insures ultimate economy. The popularity of Carnegie Copper Steel Mine Ties indicates a goodly measure of success.

*Descriptive booklet on request.*



CARNEGIE STEEL COMPANY

*Subsidiary of*

UNITED STATES STEEL CORPORATION

PITTSBURGH, PA.

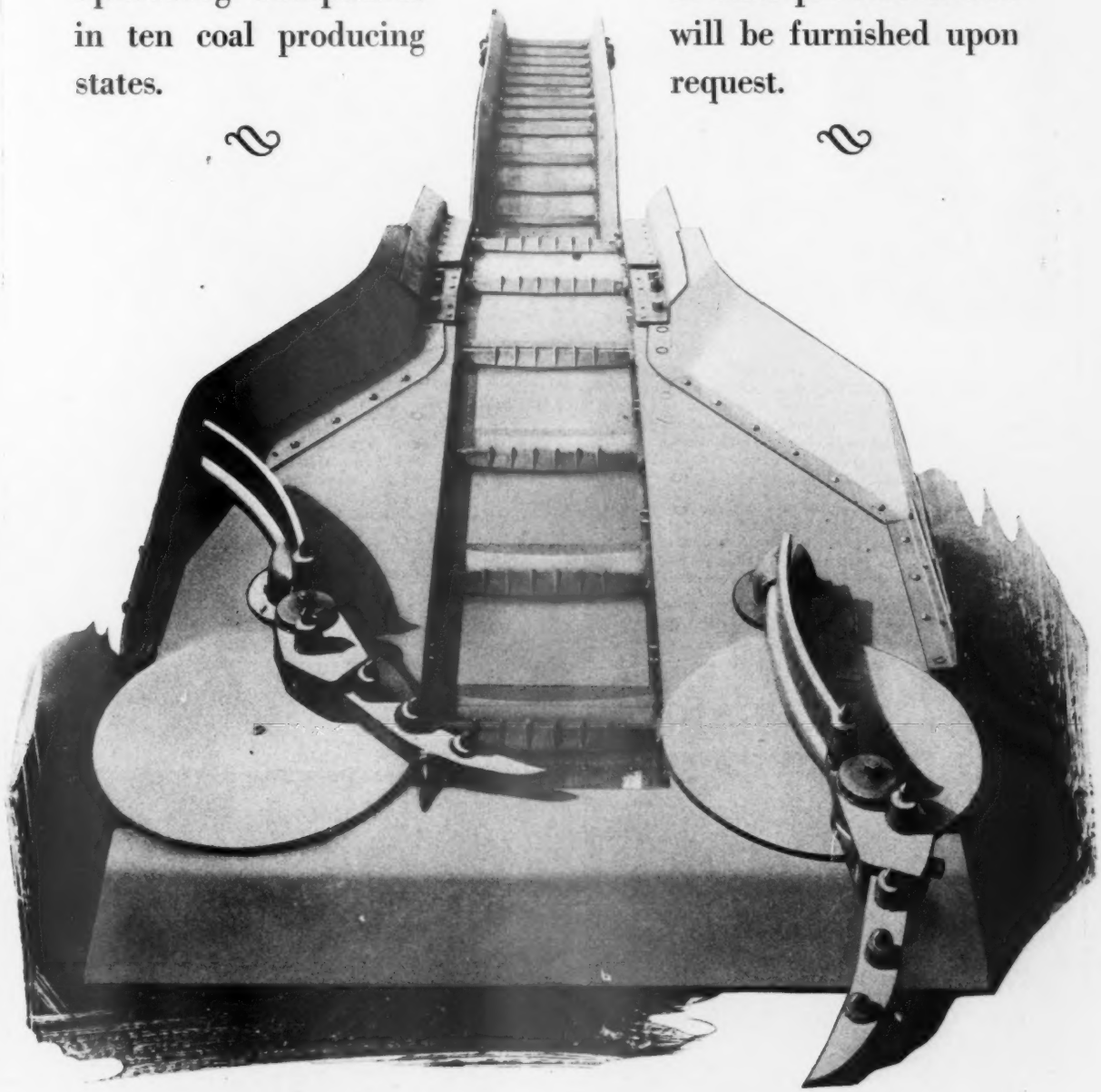
# CARNEGIE MINE TIES

1946

# REDUCE your Costs with JOY'S

Used by more than fifty operating companies in ten coal producing states.

List of users and number of units per installation will be furnished upon request.

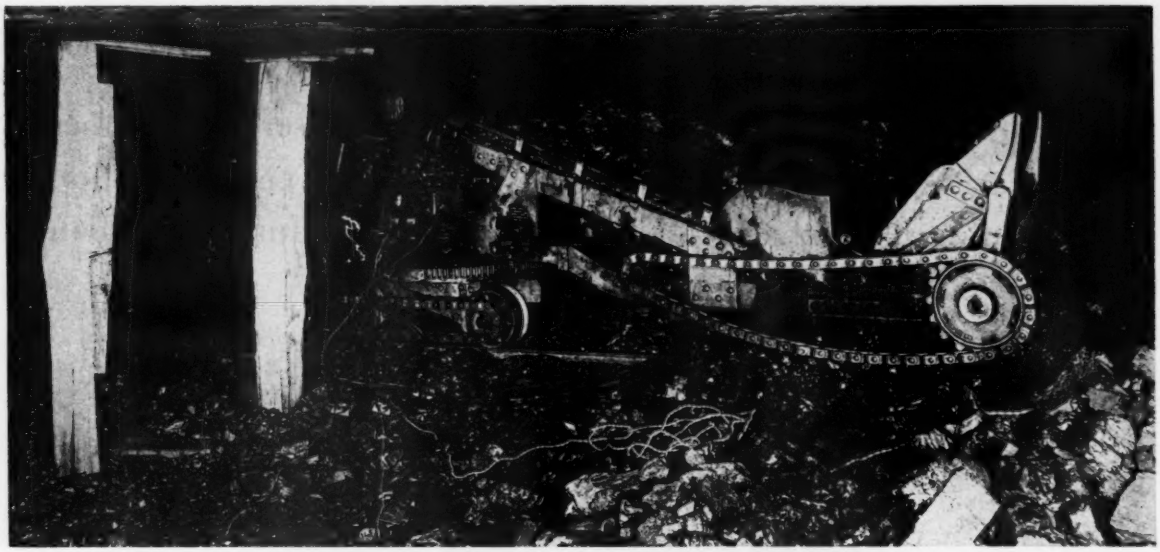


## JOY MANUFACTURING CO.

FRANKLIN, PENNA.

U. S. A.

# Mechanized Mining—20 Years Ago



LOADING COAL WITH A MYERS-WHALEY—1908

"MECHANIZED MINING" is a coined phrase much used of late to indicate the decided movement of the Mining Industry towards the use of machines in all departments of mining, but more especially the use of loading machines to increase the efficiency of man power and to REDUCE THE COST OF PRODUCTION.

This movement, so far as this company is concerned, began in 1908—TWENTY YEARS AGO—when the Myers-Whaley Company was chartered for the express purpose of building loading machines and to which purpose it has consistently devoted its entire energy and resources to this time.

While it has been hard going at times (as pioneering always is) the Myers-Whaley Company has moved forward steadily—its machines advancing ahead of the general movement, being constantly improved, and never an "orphan" in the lot.

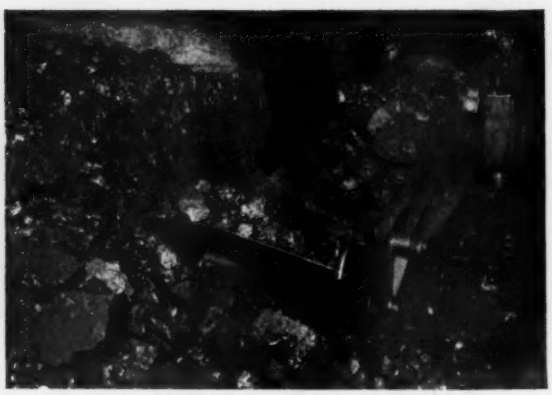
Myers-Whaley Shovels ten and twelve years old, are still giving service and are being serviced.

Many people who knew our machines ten, twelve or more years ago when they were pioneers in mechanical loading think they know Myers-Whaleys now, but this is not the case. The Myers-Whaley Machine of today is as much better than that of ten years ago as the automobile of 1929 is ahead of the machine of 1909. The old bus was a good one—the new one is better.

"MECHANIZATION" involves, not only loading of coal but loading of rock in haulage ways, grading, brushing, entry driving, track cleaning, opening up fallen territory and many other uses in which money can be saved; and, after all, "REDUCED COST," "MONEY SAVED," "LOWER COST PER TON OF COAL ON THE TIPPLE" are the ends to be achieved—Myers-Whaleys accomplish these results.

## MECHANIZED MINING TODAY

MYERS-WHALEY SHOVEL—3 SIZES



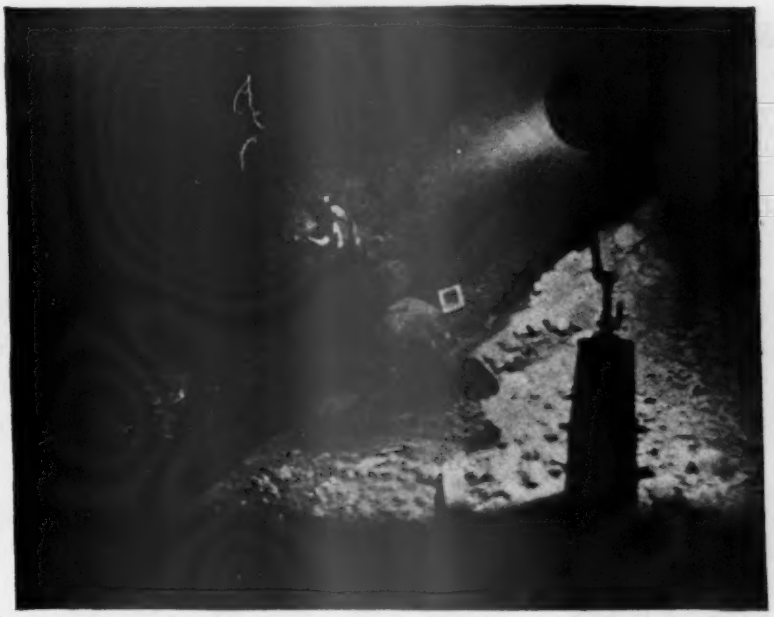
WHALEY SINGLE MOTION SHOVEL—2 SIZES

## MYERS-WHALEY COMPANY, Inc.

KNOXVILLE, TENN., U. S. A.

*Style No. 14*

Especially desirable for small stopes and roof trimming. Weighs 30 lbs. charged. One full charge burns for 5 hours.



*Style No. 2*

For use in large stopes. Weighs 37 lbs. empty and 115 lbs. charged. One full charge burns for 12 hours.

# MORE LIGHT

## means greater safety underground

### *Safety Engineers approve the Carbic Light for use in metal mines*

THE majority of accidents underground occur at the working face, where dangerous conditions are often difficult to detect with the localized light supplied by individual miners' lamps. Mine operators and safety engineers agree that many of these accidents could be prevented if additional illumination were available.

Numerous demonstrations in metal mines have proved the Carbic Light ideally suited for underground illumination. Safety engineers have proclaimed it the most practical means of increasing the safety of working conditions at the face.

### *The Carbic Flood Light is powerful*

It supplies a pure white light, strong enough to illuminate the highest stope even when filled with fog. Yet miners can work directly facing a Carbic Light because it does not glare.

It is a self-contained unit and can be easily carried about when fully charged. It is so simple any one can charge it in a few minutes. It has unique safety features. The Underwriters' Laboratories Inc. list the Carbic Light as standard.

Thousands of Carbic Lights are in use on the surface for night construction work. 14 years of service have proved its long life and low cost of operation.

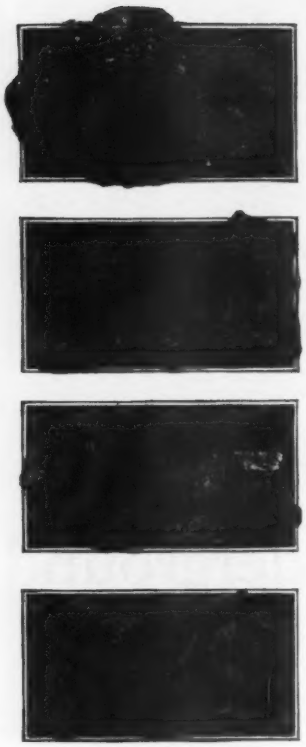
If your jobber cannot supply you, write to our nearest office.

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.

OXWELD ACETYLENE COMPANY
*Unit of Union Carbide and Carbon Corporation*
New York City 30 East 42d St. UCC Chicago Peoples Gas Bldg.
San Francisco, Adam Grant Bldg.

# CARBIC LIGHT

# Prepared coal is easy to sell!



COAL which is properly prepared is easy to sell and brings higher prices.

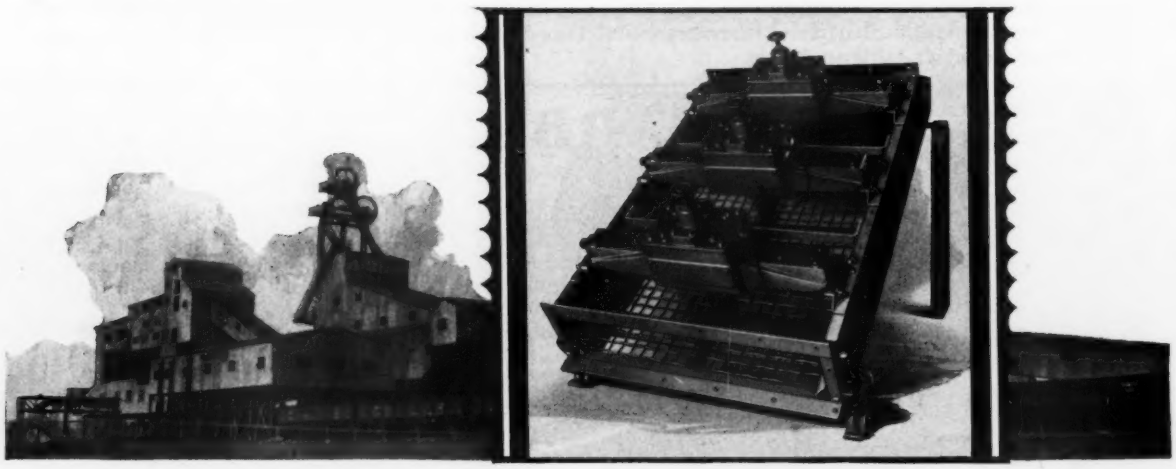
That's why coal operators everywhere are installing the Hum-mer Electric Screen—it prepares coal properly and profitably.

With Hum-mers in your plant, you'll get the speed of production—the thorough separation—and the continuous, low-cost operation that has made the Hum-mer the choice of scores of coal superintendents.

Let us refer you to them and also give you an idea of the results you could expect.

Send for the book, "Screening for Profit."

**THE W. S. TYLER COMPANY, *Cleveland, Ohio***
***Manufacrurers of* Woven Wire Screens and Screening Equipment**



## HUM-MER *Electric* SCREEN

1924~10 H.P. Drives *from Stock*

~1926 15 H.P. Drives *from Stock*

Flexible as a Belt—
Positive as a Gear—
More Efficient than Either.
(98.2% on actual test)

~*and today* ½ H.P. *to*

# 60 H.P. Drives *from Stock!*

THE convenience enjoyed by industry through the Link-Belt "Stock Drive" policy inaugurated four years ago, has now been greatly augmented.

The demand for Link-Belt Silent Chain Drives has been increasing so rapidly that now they can be obtained from Link-Belt stocks, or from distributors throughout the United States, in sizes from ½ H. P. to 60 H. P., and in speed ratios of 1 to 1 up to 7 to 1.

Recognized for a quarter of a century as the efficient, economical power transmitter, Link-Belt Silent Chain still upholds its reputation in every industry the world over as "*the ideal drive.*"

Get your copy of the new Pink List No. 725, from your distributor or nearest Link-Belt office.

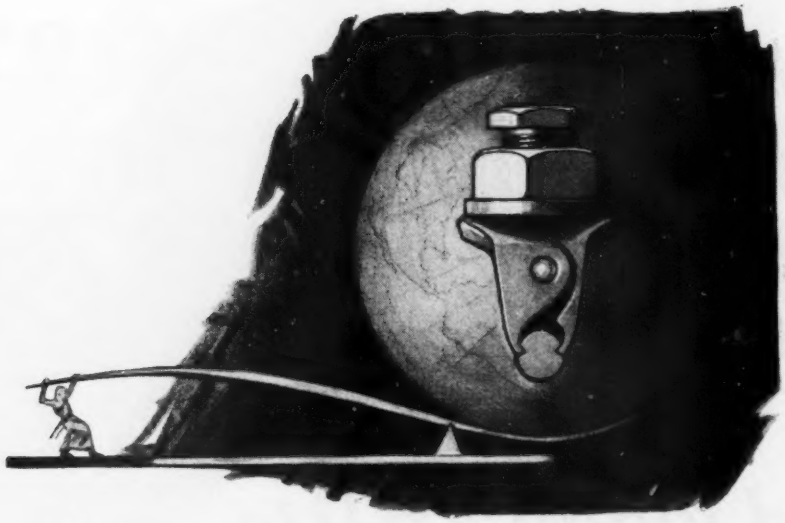
LINK-BELT COMPANY 3583

Leading Manufacturers of Elevating, Conveying, and Power Transmission Chains and Machinery

CHICAGO, 300 W. Pershing Rd. INDIANAPOLIS, P. O. Box 85. PHILADELPHIA, 2045 W. Hunting Park Ave. SAN FRANCISCO, 19th and Harrison Sts.

Ashland, Ky. Atlanta Baltimore Birmingham Boston Buffalo Charlotte Cincinnati Cleveland Dallas Denver Detroit Huntington, W. Va. Kansas City, Mo. Los Angeles Louisville Milwaukee Minneapolis Montreal New Orleans New York Oakland Pittsburgh Portland, Ore. Seattle St. Louis Toronto Utica, N. Y. Wilkes-Barre

LINK-BELT
SILENT CHAIN DRIVES



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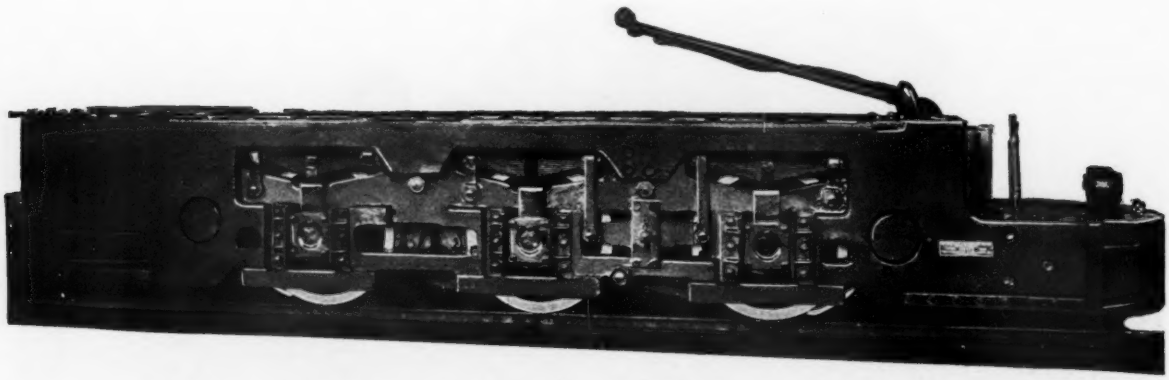

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*The*
# MINING CONGRESS JOURNAL
**A Monthly Magazine—The Spokesman For The Mining Industry—
Published By The American Mining Congress**

VOLUME 14 DECEMBER, 1928 No. 12

## *Editorials*

### *Thirty-One Conventions*

ELSEWHERE in this issue will be found the program for the Thirty-First Annual Convention of The American Mining Congress. Its range is indeed interesting. Starting with a session on International Mining, it concludes with a session on Legislation, and every session is to cover subjects that are of immediate importance to the mining industry.

The American Mining Congress, representing the whole mining industry, gives four conventions annually. Its first is for the Non-Metallics group; its second, for the Coal Division; its third, for the Metal Industries; and its fourth, the Annual Meeting that brings all of the industries together for a coordination of their problems, to inform each industry of the problems of the other, and to offer each the aid of all.

The convention beginning on December 5 is the Annual Meeting. Leaders in economic thought will address the sessions. Legislators will participate. Mining men who have made and are now making mining history in the United States will present papers; the government departments will be on hand to offer their services and to give data of great importance.

Because there is no other organization just like The American Mining Congress, there is no other convention like this annual meeting. To the individual, the convention contacts will give a broader outlook and a greater familiarity with the problems of mineral production. It enables the mining man to see with keener appreciation, present trends and possibilities for the future.

Mining, like every other great industry, each year faces new forms of competition; new conditions are to be met, new problems to be solved. This convention assures the sound solution of common problems and offers an excellent opportunity for the mining men to keep abreast of developments within the industry.

### *The American Mining Congress*

FOR thirty-one years The American Mining Congress has represented the mining industry of the United States in matters of national scope. During that time the program of the organization has embraced policies and principles dealing not only with the betterment of the mining industry but also with the welfare of the mine workers and the general good of the nation. Its work in securing the creation of the Bureau of Mines and measures for the promotion of safety, as well as cooperation between employer and employee in the mining industry, speaks well for its effectiveness, and stands as a tribute to its leadership.

The maintenance of an adequate protective tariff at all times has been one of its aims. Without adequate protection against the competition of low-cost foreign production, many branches of the mining industry would be unable to operate. Tariff protection not only has been necessary to the prosperity of American industry, but also has been an essential factor in the development of new industries promoted for the production of raw materials upon which this country would otherwise be dependent upon foreign production.

In the field of taxation, the organization secured recognition of the wasting character of the mineral industries in the income tax laws, whereby capital represented by the mineral reserves of these industries could not be subjected to the income tax as profits when extracted from the earth, but is set aside in proportionate amounts annually as a deduction from gross income in the same manner as depreciation. Tax conferences held under its auspices have had considerable influence in securing fairness and equity in the administration of both Federal and state tax laws.

It always stood for business self-government, and has opposed government in business. Only in cases where conditions in an industry warranted government regulation, and such regulation was consented to and even sought by those engaged in such industry, has this organization withheld opposition to measures expanding the functions of the Federal Government to include control over business management and activities in any branch of industry.

In its work of promoting the welfare of the mining industry in all of the activities of that industry The American Mining Congress has won and retained the respect of legislators, government officials, labor and the general public alike. And, measured by its efforts and achievements of the past, its future services as the national organization of the mining industry will continue to contribute to the upbuilding of the mining industry.

### *Coordinate Association Activities*

THE mining industry supports or helps to support a dozen or more national associations (technical or economic) and 30 or 40 state and local organizations. All of these are doing things for the industry. Every one of them wants to justify its existence to the industry financing it.

This ardor to justify existence is becoming a costly thing for the mining industry. Agency after agency is duplicating work and effort. This duplication is both expensive and wholly unnecessary.

There is room, *and at the top*, for many different kinds of organizations in the mining field. For instance, there is a vast amount of room for the safety work of the Bureau of Mines. That bureau should be the leader in all mine safety work, with national, state and local organizations cooperating either through properly recognized committees or through some other form authorized by the organization so cooperating.

In legislative and economic work The American Min-

ing Congress stands preeminent. It represents 87 percent of mineral production. It has a record of achievement that is most praiseworthy. It may be made sponsor for all legislative activities of the mining industry with all other organizations, through committees or otherwise, cooperating in seeing that all branches of mining get a fair deal. With all branches so speaking together, as one voice, the result should be of decided benefit to the industry as a whole.

The American Institute of Mining and Metallurgical Engineers is the leading technical association of the mining industry. Its studies in metallurgy and recovery and utilization of minerals is a marvelous aid to the science of mining. It should have the cooperation of all mining organizations.

There are many associations such as the Petroleum Institute, the National Coal Association, the Iron and Steel Institute, the American Zinc Institute, the Copper and Brass Research Association, that are preeminently constituted to do specific things for the industries they represent, and there should be no duplication by other agencies of those things that they are qualified to do for the industry.

All of these organizations are doing big things. But in doing these big things all of them—from the Bureau of Mines, The American Mining Congress, the Institute, the National Safety Council, the National Coal Association, on through the list, are duplicating effort.

Is it not possible for all of these organizations to get together? Can they not so coordinate their activities as to eliminate duplication?

Those who pay the expenses of these organizations should themselves insist that their money be spent to the best advantage. The mining industry has been prolific in telling the Government to avoid duplication of effort, to coordinate its activities, and has been prone to criticize it severely because it has not done so. Can not the industry follow its own advice, and put its own house in order?

### *Worth While Work*

DURING the last twelve months we have carried in these pages a review of the activities of national organizations representing the mining industry. This review shows the range of studies being carried on in behalf of mining. It seems to us that these great organizations are doing most constructive work.

The problems of the mining industry embrace broad classifications. These are briefly legislative problems dealing with national laws affecting mining, such as taxation, public lands, tariff, anti-trust, etc.; practical operating problems, dealing with the actual production of the minerals; metallurgical problems, dealing with the beneficiation of ores; and marketing and utilization problems, dealing with distribution, transportation and research.

The field of research in the metal industries is being developed rapidly. Copper has its Copper and Brass Research Association; Zinc has its Institute; Iron and Steel its Institute; Oil its Institute; Lead has just organized an Institute; all with the definite idea of proper utilization of the product, with research looking to new uses.

In the Anthracite industry their Bureau of Information has done conspicuous work. In Bituminous coal the recently established "International Bituminous Coal Conference" is the first big effort to discuss utilization. But instead of there being a conference once each year, the bituminous coal industry, more than any other, needs a permanent research organization. It needs a Coal Institute. The National Coal Association is preeminently fitted to do just such work, and offers to the coal operator an opportunity for constructive service in this connection.

It is difficult to define just where one association's work should begin and where the other should leave off, but it is not impossible.

### *Safeguarding Two Million Workers*

THE major activity of the United States Bureau of Mines during the present year has been the safeguarding of the two million workers within the mining industries, according to Scott Turner, the Director of the Bureau, in his annual report to the Secretary of Commerce. He points out that among the measures taken to insure this safety has been the training of nearly fifty thousand workers in first-aid or mine-rescue work, establishing a new record for such activities and bringing the total number so trained by the Bureau to approximately two hundred and fifty thousand. The Bureau has actively advocated the thorough rock-dusting of bituminous coal mines, conducted tests to determine explosibility of various coal dusts; issued and maintained a list of permissible explosives; maintained an exchange of workers in mine safety research, with interchange of information between the Bureau and the British Safety in Mines Research Board; and given special attention to sanitation problems.

The United States Bureau of Mines was created originally as a "Safety" organization. As the Bureau grew, as appropriations became larger, the demand from industry increased, and the Bureau found itself headed in many directions, without appropriations to carry on in any one direction with the efficiency it stood for. Safety in minerals production became one of the activities of the Bureau instead of its main function.

The result has been that the mining industry has failed to utilize the facilities of the Bureau. Thus we see research organizations developed within all branches of the industry. These organizations have been and are cooperating with the Bureau, but they can not afford to wait a year or two for the results of an investigation to become available to them.

This is not the fault of the Bureau so much as the result of the rapidity with which the mining industry has progressed. The slow mechanization of a government bureau could not hope to keep abreast of developments, unless it had funds and personnel to enable it to do so. The wonder is that the Bureau has been able to do such effective work as it has with the limitations surrounding it.

### *Let's Pull Together*

THE safety work of the mining industry belongs to the Bureau of Mines. The legislation creating the Bureau made this plain. More funds should be made available to the Bureau to effectively conduct its work along this line. But in advocating more funds it should be kept definitely in mind that the Bureau is the servant of the mining industry, and not the arbiter of that industry's destiny. There has been some unfortunate idea prevailing in the Bureau that it should promulgate rules and regulations, and that the industry must accept those rules and regulations, whereas nothing has ever been gained in any great cooperative agency, unless the cooperation was a reality and the coercion with a velvet hand. If the ideas which the Bureau has are worked out in conjunction with the industry, if the ideas they have are sold in their inception to the mining industry, the Bureau will have little diffi-

culty in securing the whole-hearted cooperation of the industry. But if they are to be arbitrary about it, seeking to force the view of a few down the throats of the many, they will continue to find opposition.

The Bureau needs and must have the sympathetic cooperation of the mining industry. The industry needs and must have the sympathetic cooperation of the Bureau. Let's pull together.

### *The Lead Institute*

THE Lead Industries Association has been organized by the producers and consumers of lead. According to their announcement the association "intends to promote the service and stability of the lead industry to the community at large." It expects to disseminate information regarding the use of lead products, to collect statistical information regarding production, distribution, marketing and consumption of lead and lead products, and to develop methods of improving the welfare of those engaged in the lead industries. This is in line with the action taken by other metals, including copper and zinc. It is similar to the long-established Iron and Steel Institute. And it is a step in the right direction for the biggest problems facing industry today are utilization and proper marketing. The companies associated in the new organization give promise of excellent results.

### *Stupendous Figures*

STATISTICIANS have been busy since the election. But none of their figures is more graphic than those in connection with the record vote of more than thirty-five millions. They have pointed out that if each voter occupied only one minute in voting, it would have required more than twenty years for this procession of men and women to pass one ballot box. And yet we had the result of that vote in our possession in less than twenty-four hours.

The pageantry of fact displayed in the last election has never before been recorded in the world. It could be a fact in no other place than the United States. And those cynics who have been insisting that democracy is on the wane will do well to have their perspective readjusted to the tune of the greatest spectacle ever witnessed in the choosing of a form of government.

### *Hoover's Responsibility*

HERBERT HOOVER, the Engineer-President-Elect, has before him a gigantic task, a great responsibility. His first public utterances, after his overwhelming victory, give definite indication as to the kind of President he will make. He urges "cooperation by all leaders of opinion and of action for the common service of our country." He is not merely the successful candidate of a party: He has been elected President of the whole United States of America. As such he will represent alike the Republican, the Democrat, the Socialist, and all other factions of thought.

More than six millions majority in popular vote means a great responsibility. His electoral victory, overwhelming as it was, but adds to that responsibility. The return to Congress of a big majority of his party, giving the administration full control, multiplies that responsibility greatly.

The people have expressed unbounded faith in Mr. Hoover. They have placed in his hands, with confidence, the guiding of this nation through the immediately ensuing four years.

Mr. Hoover will need, and he will welcome, all of the help he can get. He will not overlook the vast vote of that group of citizens who agreed with his opponent. Nor will he minimize the vote which has placed responsibility in his hands.

### *Practical Politics*

ONE of the leading daily newspapers complains of Mr. Hoover's management of his campaign because of his "practical spirit" and attributes it to the application of the engineering mind to politics.

In reading some of the comments upon the Engineer-for-President, one is inclined to believe that this profession is singled out as being different from the rest of the human race. Perhaps the engineers themselves are responsible for this situation. They have placed their profession upon as high a place as they can obtain and have steadfastly maintained that position. But the engineer, be he mining or other, is just as much of a human being as the rest of us. The problems of the engineer touch humanity at every point.

In addition to bringing to the Presidency a mind that is trained along engineering lines, Mr. Hoover brings a mind that is trained along the needs of the human race. His history is familiar household information. He has served the great mass of humanity as well as the great industries of the world.

J. V. N. Reynders, formerly president of the American Institute of Mining and Metallurgical Engineers, in taking issue with the viewpoint that the engineer is a machine, and particularly referring to Mr. Hoover, in a recent issue of the New York *Times*, said:

"Engineers do not differ radically from other human beings, and, above everything else, they are not human machines.

"Mr. Hoover is not going to create a new era in this country. The new era is already here. We may not like the kind of an era, but that will not change the fact that humanity has become mechanized with all that the term implies. There is a dynamic potentiality in a homogeneous body of 110,000,000 people, reinforced as we are by mechanical power, for which there is no precedent in history. The effect upon our institutions, upon our industrial and financial organization and, above all, upon our social system is beyond the measure of any existing yardstick.

"Is it not fortuitous to a degree that for a period of years we will have at the helm one whose mind, from the force of circumstances, has been trained to think in accurate terms, which is the very basis of engineering?

"If, as is not unlikely, we are living in a period of transition involving a new set of economic factors, Mr. Hoover's executive qualities, reinforced by his engineering background and supplemented by his humanitarian experience, would seem to constitute a timely and happy combination."

The application of engineering principles to government is no cause for alarm.

### *The South American Trip*

A READING of the Annual Report of the Bureau of Foreign and Domestic Commerce will throw considerable light upon the trip of President-Elect Hoover to our Latin-American neighbors. Within the short period of fourteen years, our total export and import trade with these countries has increased from less than $800,000,000 to approximately $2,000,000,000. We buy more from them than we sell to them. Most of our purchases are in the form of raw

materials, which are manufactured in this country and exported to them. They are customers for our manufacturing industries; for our automobile industry; and for the mining machinery industry. All of these countries have vast mineral resources. The surface has but been scratched and the possibilities offered to American industry as these resources are developed are sufficient to arouse the keenest interest.

Mr. Hoover's trip should be a great thing not alone for the commercial aspects of the Americas, but in the fostering of the proper spirit of friendliness and cooperation that should, and does, exist between these great countries and the United States.

### *Mechanization*

IF anyone doubts the earnestness with which the mining industry is attacking its problems of mechanization, we should like to call their special attention to the newly organized Committee on Mechanized Mining, which is to be the National Research Committee on this important subject. Last month we announced the appointment of a national chairman and general chairmen of the committee, representing every phase of the production of coal; we also announced the state chairmen, who will represent the industry and the committee within certain areas.

With this issue we announce the appointment of District representatives. These representatives are not all yet appointed, but the group is already an imposing one and represents many of the most progressive men and companies in the industry. It is a significant fact that in the organizing of this national committee, the sponsor organization, The American Mining Congress, has received 100 percent cooperation. In every instance the men and the companies have been willing to cooperate, have been anxious to assist in the work and are enthusiastically undertaking the actual details of gathering the information.

The personnel of the committee is progressive and outstanding. The program is far-reaching, practical and workable. The organization sponsoring the work has a reputation for accomplishing results. Such a combination ought to succeed. We shall watch with interest the developments in their work over the next twelve months. The program is for five years, but a good start should be made within the next year, and with a committee as earnest and interested as this one is the industry may hope for much good to accrue from its activities.

### *Secretary Green And Mechanization*

THE American Federation of Labor, through President William Green, has announced that it will fight the introduction of machinery into industry, on the theory that the machine will displace the man. Mr. Green declared for a higher standard of living for the workman, shorter working hours and more time for recreation. He gave the objective of the Federation as that of human betterment.

One needs to go back only twenty-five years to secure all of the evidence needed to prove that Mr. Green is on the wrong track when he adopts a belligerent attitude toward the adoption of machinery in industrial production. In that period the power industry has taken from the backs of the worker the body-breaking, soul destroying, arduous toil of hand labor. Would Mr. Green have us go back to the days of the horse and plough? Surely more men were needed to till the soil under that method than is today required with the power tractor. Would he have us go back to the old days of drudgery that made life a weary burden, simply because more men might be employed per industry?

Would it not be wiser for the Federation to advance with civilization, instead of fighting it? Accept the benefits that have accrued to the class it represents and find new avenues to dispose of labor's needs. Every labor-saving device and every new machine that has cheapened production has given the advantage to the laboring man through bringing to him just exactly the things that Mr. Green states his organization is working for. They have brought him increased comfort, increased leisure and increased financial rewards. Where twenty-five years ago the working man who possessed an automobile was a rarity, today the workman who does not possess one is the exception. But a short time back few workers had either the time or the money to seek recreation. Today he fills to overflowing our movie theaters and our amusement centers. He is happier, healthier, more contented than ever in his history. And the result has not been achieved through keeping him, in large numbers, digging ditches with teaspoons.

### *The Transition Period*

HARKING back to the time-tested theory that the worker can obtain advancement only through production, it will be interesting to know just how the Federation hopes to create the conditions it aspires to. How else does it hope to attain its desire except through the multiplying of the workman's productivity? Higher wages and shorter hours are the natural outgrowth of increased production, and its attendant increase in wealth. There is ample evidence to substantiate the fact that the worker has gained materially through the adjunct of the machine to his intelligence.

No one will seek to deny that the substitution of machinery for hand labor temporarily causes discomfort; nor that such transition should be brought about gradually and intelligently, but to prohibit the use of machinery because of such temporary hardship is to kill the goose that lays the golden egg. Machinery is not the enemy of the workingman. The whole process is a circle beginning with the worker and ending with him. Through the worker, plus the machine, enormous increase in production is possible. Its sale must be to the masses, who in turn produce materials that must be consumed by the masses. The employment of capital in these enterprises, plus the proper adjustment of wages, is the very essence of our economic structure. To destroy the machine, means the destruction of our civilization.

### *Competition Makes Mechanization Necessary*

COMPETITION is the big factor in industrial life. The surface car with the elevated and the subway and the motor bus, the legitimate stage with the moving picture industry; the radio, the automobile, the endless procession of developments that displace something else. Labor is facing certain displacement in industry where the production may be more efficiently, safely and economically handled through the machine. But what of it? That same industry, which displaces the men with machines, creates new industries that will absorb them. In the mining industry coal is

faced with the substitute oil; in the lead, copper and zinc industries the same question of substitution is rampant. But do these industries sit still and howl because their supposed personal market is being snatched from under their very noses? They most certainly do not. They are answering back completely and effectively, and are finding new ways of utilizing their product.

Labor has not a monopoly of the displacement business. It is a thing that is a very definite part of all business, and most businesses are quietly and adequately meeting the situation without recourse to heroics.

### *Released Workers*

ACCORDING to the *Brotherhood of Locomotive Engineers' Journal*, there is a real and serious question confronting the working men of the United States. They point out that when a man is released from one industry he finds in his search for employment that the same thing is happening in every business. They also state that there are nearly one million fewer people employed in the factories of the United States now than in 1920. In the same length of time the railroads have reduced their number by nearly two hundred and fifty thousand. They also assert that there are machines that now turn out as much as was formerly manufactured by several factories. One employe now turns out thousands of a given commodity, where he formely could only turn out hundreds when working at top speed. They insist that the employer runs his factory or business less efficiently in order that he may employ more men, and urge as the only logical solution the shorter day and more money for time worked, together with federal old-age pensions and unemployment insurance.

Let us see how their information measures up against the figures of the Department of Commerce. In a recent speech, quoted in our November issue, Dr. Klein, of the Bureau of Foreign and Domestic Commerce, says that new industries have absorbed one million one hundred and twenty-five thousand men, formerly factory workers. This number alone has been employed in the automobile industry since 1920, and completely accounts for the surplus the Brotherhoods find released from factories and railroads. But in addition, Dr. Klein points out the vast numbers now being utilized in our radio, our motion picture, our airplane and our power industries, just to mention a few that have had phenomenal growth since 1920.

Again we agree that the period of transition must be accorded special attention, but we are not in the least alarmed or in sympathy with the alarmists.

### *Secretary Davis' Views*

SECRETARY of Labor James J. Davis, addressing the American Federation of Labor, took an exactly opposite stand from Mr. Green. He said, in speaking of the worker: "Now he knows that the more he produces the greater the fund from which his wages come, and the better chance he stands of getting his share in a higher wage. * * * Today our workers share in the wealth now being produced and help create prosperity because they have acquired all that multiplicity of wants that once distinguished only the well-to-do. * * * The new thing we have learned in America is that before you can have economic progress you must accomplish two things. The first is to create a multiplicity of desires, and the other is to enlarge the class of people that shares this multiplicity of desires. * * * Business leaders will soon link the shorter day with the higher wage as a cardinal principle of prosperity. Our fast machines must be taken for what they are—creators of leisure as well as creators of wealth. * * * Every day industry, as it throws out men, creates new industries and opens up new avenues for profit and employment. The twin processes go on side by side and almost at an even pace."

The real difference in the two addresses is that Mr. Davis is looking at labor as a great whole, while Mr. Green is looking at labor through the narrow bi-focals of Union Labor.

### *More Along The Same Line*

PRIOR to the utterances of President Green concerning the danger of mechanization, the following appeared in the October 20, 1928, issue of *The Illinois Miner:*

"Since the adoption of the new agreement, the conveyor loading machines have been taken out of the four mines of the Crescent Coal Company near Peoria.

"This is by far the largest coal company operating in the Peoria district. Nearly 120 conveyors were installed in the four mines. All have been taken out and miners placed on hand loading.

"This is directly attributed to the new agreement which maintains a relatively high wage scale on loading machines of various types as compared with the hand loading rates and thereby discourages the introduction and use of the so-called 'labor-saving' machinery in the mines of this state.

"The miners in the Peoria district have been very much opposed to the introduction of loading machines and conveyors because with them a greater tonnage is produced with fewer men. * * * William Hartness, District Executive Board member from the Peoria district, has for a long time been making a strenuous fight for a tonnage rate on conveyors and is greatly pleased that the conveyors have been taken out of these mines. At the present time there is not a loading machine or conveyor operating in the mines of Springfield, Peoria, Danville or Northern Illinois districts."

Such an attitude on the part of union labor certainly will not advance its cause. Bituminous coal will never be made a profitable industry through the elimination of power equipment and the substitution of hand labor, no matter if the industry thereby would be compelled to utilize the service of twice its present personnel. It might be well for the officials of the unions who are so short-sighted to ask Dr. Klein, of the Department of Commerce, to furnish them with some facts on industrial development through the use of machinery and the outgrowth of new industry through the same channels.

### *The Coal Conference*

THE second international bituminous coal conference which just closed is of great importance. It points definitely to a future for coal that is not as yet within the grasp of those of us who are not scientists. One of the leading Pittsburgh papers expresses it in this way: "Laymen will hardly comprehend this work as it is in its progressive stages. Yet laymen are directly involved in the benefits which will be the fruit of the conference, even though recognition may not come until the subjects of discussion are translated into practical materialism. This is another manifestation of the advancing manner in which the laboratory is helping founded industry and creating new industries,

in turn making for better standards of living through developing for general use resources heretofore hidden."

The conference was attended by the leading scientists of France, Germany, England, Austria, Italy, Russia, Belgium and other countries, as well as by the leading scientists in the United States. Dr. Thomas S. Baker and the Carnegie Institute of Technology are to be congratulated upon this successful undertaking. They have made a distinct contribution to science and to the coal industry.

### *The Fall of Socialistic Doctrines*

ONE of the most important factors in the result of the recent election is that the theory of government control and operation of industries received a serious blow. There was rather widespread alarm before the election that a radical Congress might be returned, and that we would be subjected to an orgy of legislation designed to foster public ownership and general regulation of private business. That such is now definitely not the case is of the highest importance to the business of the country.

The Congressional election gives the balance of power to the conservative group. In the recent Congress, with the so-called Progressives holding the balance of power, compromises have been necessary that will not be considered with the new Congress. There is little likelihood that the present measures before the Congress can be definitely considered at the short session, and the country may feel quite certain that there will be no improper intrusion of government into business during the Hoover administration.

The agitation during the campaign for government control and operation of certain of our natural resources received a death blow at the hands of the voters. It is inconceivable that it can come to life in the near future.

### *The Opposition Party*

NICHOLAS LONGWORTH, Speaker of the House of Representatives, and one of the finest minds in Congress, has an address which he makes upon occasion, in which he emphasizes the importance of Party Government and especially the strong ("but not too strong") opposition party.

In the present election there has been much talk about the decline of the Democratic Party. It has given heart to the Workers' Party, who are freely predicting the fall of the Democrats and the rise of the Farmer-Workers' Party as the "Opposition Party" in the next election. Equally Norman Thomas, the candidate for the Socialist Party, is hopeful that the defeat of the Democratic Party will permit his party to "build that progressive party of workers with hand and brain for which we Socialists fought with so much encouragement in this campaign."

But while the Socialists and the Communists take heart because of the difference of opinion in the Democratic Party's ranks, there is no cause for alarm. Every principle advocated by either of these groups received its death knell at the hands of the electorate on November 6.

The Democratic Party as exemplified by the last public speech of its candidate, Mr. Smith, as evidenced by the great popular vote that was accorded him in the election and by the rise of leadership within the party, shows no sign of decay. Four years hence the Democratic Party will be the same formidable opposition that it has been in previous campaigns. There is every reason to believe that it will be stronger, instead of weaker. Let the elements of destruction have their moment. It will be brief.

### *The Workers' Party*

WILLIAM Z. FOSTER and Benjamin Gitlow, the leaders of the Workers' Party in America, headed their ticket in the recent election. The entire poll of the vote is not available, but it was comfortably inadequate for those who have the interest of their country at heart, and woefully inadequate to those who are directing this misguided organization.

A look at the tickets for this party is sufficient to indicate the element that is advocating these doctrines in this country. Here is a group of names taken at random from a list of the party's official representatives: Karidemos, Matyzik, Radulovic, Zirganos and Siennickiki.

It is apparent to anyone who will take the time to investigate it that the controlling elements in this party are from communist Europe. It is equally true that their advancement in this country is not rapid. But it is appalling that they can even muster a few thousand votes, and emphasizes the importance of continuing our restrictive immigration policy.

### *A Comparison 1927-1928*

STATISTICS of Income published by the Treasury Department for the calendar year 1927 show a decrease in corporation net income of $1,144,062,745 and in tax of $173,023,592, as compared with 1926. However, the individual income tax returns for 1927 show an increase in the total net income of individuals of $1,008,141,581 and an increase in the tax of $98,766,071. Thus it appears that while corporations in 1927 were less prosperous than in 1926, individuals were enjoying a greater prosperity. Considering business as a whole, and taking the 1927 returns of both corporations and individuals as indicative of business conditions, there was no serious depression or unemployment during 1927.

The annual survey of the nation's trade made by the National Association of Manufacturers for the calendar year 1928 indicates that this year will show a very considerable increase in business over 1927. In fact, if the increases in trade reported to that association by practically every section of the business world proves accurate, the level of prosperity for this year may be measured by as high a corporate gross income as was reached in 1926, when the gross income of corporations amounted to $118,022,117,287, the highest on record since the War. The association's survey indicated an improvement in the textile industry, reported shortages in both skilled and unskilled workers and increases in wages, and increased production in the majority of the manufacturing industries.

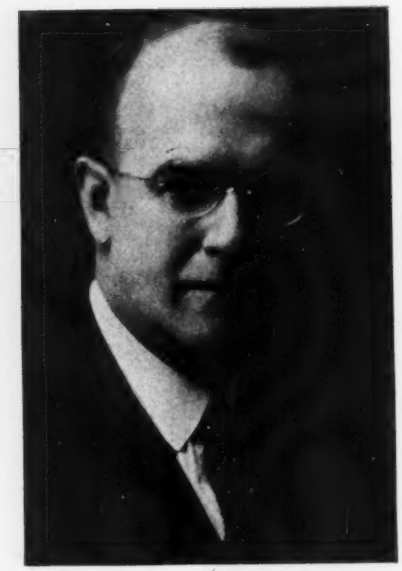
The outlook for 1929 gives promise of reaching a new high level of prosperity, if prosperity is to be gauged by the volume of the nation's business. There will be increased production, increased sales, renewed activity in construction, and continued improvement in the foreign markets for our exportable surplus. If these conditions obtain, the increased receipts from the income tax for 1929 should be sufficient to cover that year's share of the cost of the Government's present building construction and food relief programs, and possibly at the same time permit a further reduction in taxes to be made.

*J. G. Bradley*

*President of The American Mining Congress*

# THIRTY-FIRST AN
# *The* AMERICAN

*William H. Lindsay*



*Jesse B. Warriner*

*James T. Skelly*

*George B. Harrington*

DIRECTORS OF THE AMERICAN MINING CONGRESS

## *ANNUAL MEETING Of Or Week Of December 3, At May —Unusual Program Of Wide national Mining Session— cials Of Govern*

THE program for the thirty-first annual convention of the American Mining Congress, to be held at the Mayflower Hotel, Washington, D. C., December 5 to 8, inclusive, is one of unusual merit. The addresses scheduled and the speakers are of national importance.

The convention opens on Wednesday, December 5, the morning being given over to registration of delegates, and visiting. An informal luncheon to delegates will be tendered by the organization at 12 noon, in the Garden, at the Mayflower. Three-minute talks by representatives of industry will be made. J. G. Bradley, president of the Elk River Coal & Lumber Co., and President of the American Mining Congress, will be host. The speakers are as follows:

A. G. Mackenzie, secretary, Utah Chapter, the American Mining Congress.

J. D. Conover, secretary, Tri-State Zinc and Lead Ore Producers Assn.

G. Chester Brown, secretary, California Metal and Mineral Producers Assn.

W. E. E. Koepler, secretary, Pocahontas Coal Operators Association.

J. D. Zook, president and chief commissioner, Illinois Coal Operators Labor Association.

H. N. Eavenson, Howard N. Eavenson & Associates, Pittsburgh, Pa.

Stephen S. Tuthill, secretary, American Zinc Institute.

Henry M. Rives, secretary, Nevada Mine Operators Association.

The first formal session of the convention will be held at 2 p. m., in the main ball room of the Mayflower. The subject for discussion will be international mining, and representatives of all of the foreign nations have been invited to attend and participate. An interesting feature of this session, which will be presided over by Mr. J. G. Bradley, will

# NUAL CONVENTION MINING CONGRESS

***ganization To Be Held During flower Hotel, Washington, D. C. Interest Arranged — Inter· Speakers Include High Offi· ment And Industry***

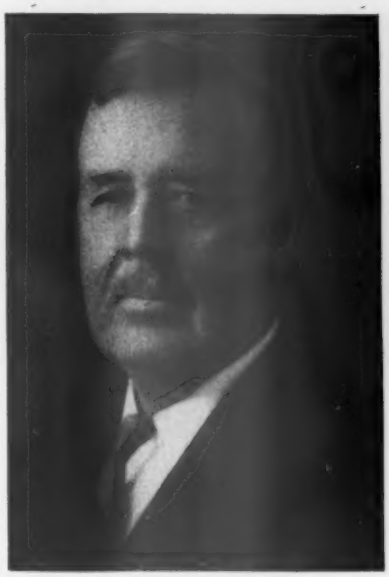
be a paper by J. W. Furness, chief of the Minerals Division, Bureau of Foreign and Domestic Commerce of the Department of Commerce, on the Flow of Minerals Into World Trade. Mr. Bradley will make his address as President of the Organization, and representatives of Canada, Argentine, and South Africa will discuss the international mining situation.

Mr. Jesse McDonald, president, Downtown Mines Company, Leadville, Colo., and a director of the American Mining Congress, will preside at the Thursday morning session which will discuss Taxation of Minerals. This session is an extremely important one, due to the developments that have taken place during the year in mining tax matters. The Hon. E. C. Alvord, special assistant to the Secretary of the Treasury, will discuss "The New Income Tax Regulations." H. B. Fernald, of Loomis, Suffern & Fernald, and a member of the Tax Committee of the American Mining Congress, will discuss "Taxation of Income and Gains from Securities." R. C. Allen, vice president, Oglebay, Norton & Company, of Cleveland, will discuss "A Business Man's View of the Tax Situation." Special discussion on the question of "Practicability of a Percentage of Income Basis for Determining Depletion" will be led by McKinley W. Kriegh, of the Tax Division of the American Mining Congress.

A discussion of some of the problems of the coal industry will occupy the Thursday afternoon session, with Mr. Archibald Douglas, Douglas, Armitage & McCann, and a director of the American Mining Congress, presiding. Problems relating to both bituminous and anthracite will be discussed. The speakers will be J. D. Francis, vice president, Island Creek Coal Co.; A. B. Jessup, Jeddo-Highland Coal Co., and H. E. Willard, United States Coal Company.

*Jesse F. McDonald*

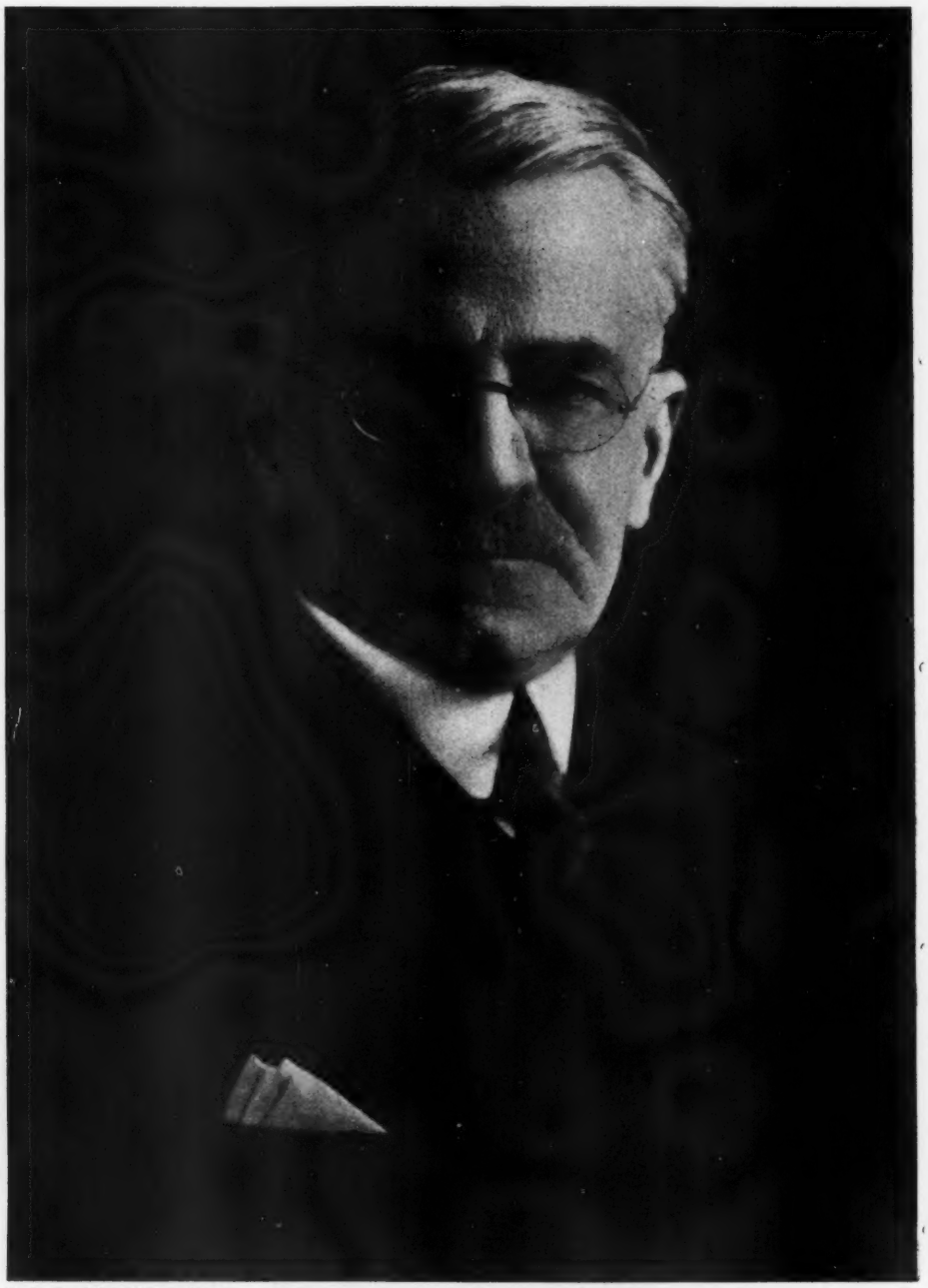
*Louis S. Cates*



*J. F. Robinson*

*Robert E. Tally*

DIRECTORS OF THE AMERICAN MINING CONGRESS



*Underwood & Underwood*

*James J. Callbreath*

*Secretary of The American Mining Congress*

*Stanly Easton*

*Hugh Shirkie*

*Archibald Douglas*

Mr. Otis Mouser, president, Stonega Coke and Coal Company, will preside at the Friday morning session, which will discuss the problems of mechanization, in their relation to industry. At this session the subject will be treated from its broader aspects, but a special meeting of the newly created National Committee on Mechanized Mining, will be held Friday afternoon. Speakers for the morning session are Col. M. C. Rorty, vice president, International Telephone and Telegraph Co.; J. B. Pauley, chairman of the board, Miami Coal Co., and Dr. L. E. Young, vice president, Pittsburgh Coal Co. Dr. Young, who is chairman of the National Committee on Mechanized Mining, will preside at the session of the committee.

The meeting of this committee will not interfere with the general session of the convention on Friday afternoon, which will be devoted to problems of the metal producers. Robert E. Tally, general manager, United Verde Copper Co., and a director of the American Mining Congress, will preside. Speakers for this session include C. F. Kelley, president, Anaconda Copper Mining Co.; Hon. Chas. B. Robbins, Assistant Secretary of War; S. L. Mather, vice president, Cleveland Cliffs Iron Company, and B. Mifflin Hood, president of B. Mifflin Hood Brick Company.

J. B. Warriner, vice president, Lehigh Coal & Navigation Co., and a director of the American Mining Congress, will preside at the Saturday morning session. The session will discuss the present legislative situation, and the speakers include Hon. Tasker L. Oddie, chairman, Senate Mines and Mining Committee; Hon. Scott Leavitt, Congressman from Montana; Hon. Harry L. Englebright, Congressman from California, and William J. Sherrill, chairman, American Standards Association.

On Saturday afternoon there will be an informal standardization conference, to be held under the auspices of the National Standardization Division of the American Mining Congress. This meeting is for the purpose of discussing the present and future status of standards work in the mining industry, and will be under the direction of J. M. Hadley, secretary of the Standardization Division. It is expected that Col. Warren R. Roberts, chairman of the Coal Mining Branch of the Division, and Lucien Eaton, chairman of the Metals Branch, will discuss the future of the work of their respective branches.

The annual banquet will be held on Friday evening, December 7. A program of great interest and entertainment is being arranged. The Hon. Carl D. Marshall, of Mississippi, will be one of the speakers, and special music is being arranged with the National Broadcasting Company.

Special entertainment is being arranged for the ladies. Golf facilities will be available at the various clubs. A reception and dance will be held on Thursday evening, and a luncheon for the ladies will be given on Thursday.

The program is being arranged in such a manner as to take a minimum of time in the presentation of papers, and to leave more time open for recreation. Certainly the whole convention offers an excellent opportunity to combine business and pleasure in a most effective manner.

*Mayflower Hotel, Washington, D. C., where the sessions of the convention will be held*

# PROGRAM — Thirty-First Annual Convention of the American Mining Congress

## Mayflower Hotel, District of Columbia, December 5-8, 1928

**9 A. M., WEDNESDAY, DECEMBER 5**

*Registration of Delegates—Mezzanine Floor—Mayflower Hotel*

*(The convention will formally open at 2 p. m. Registration begins at 9 a. m., thus affording an opportunity for delegates to get settled at the hotels and visit with friends)*

*(All sessions will be held in Grand Ball Room, Mayflower Hotel)*

*NOTE—On Wednesday morning, Mrs. Townsend will give the first of her musicales at the Mayflower Hotel. Lucrezia Bori singing. Delegates wishing to attend, please advise registration desk.*

**12 NOON, WEDNESDAY, DECEMBER 5**

**INFORMAL LUNCHEON TO DELEGATES**

*SPEAKERS [3-Minute Talks]*

A. G. Mackenzie, *Secretary, Utah Chapter, The American Mining Congress.*

J. D. Conover, *Secretary, Tri-State Zinc and Lead Ore Producers Assn.*

G. Chester Brown, *Secretary, California Metal and Mineral Producers Assn.*

W. E. E. Koepler, *Secretary, Pocahontas Coal Operators Association.*

J. D. Zook, *President and Chief Commissioner, Illinois Coal Operators Labor Association.*

H. N. Eavenson, *Howard N. Eavenson & Associates, Pittsburgh, Pa.*

Henry M. Rives, *Secretary, Nevada Mine Operators' Association.*

Stephen S. Tuthill, *Secretary, American Zinc Institute.*

**1.30 P. M., WEDNESDAY, DECEMBER 5**

**Preliminary Meeting of Members**

**2 P. M., WEDNESDAY, DECEMBER 5**

| Topic **INTERNATIONAL MINING** | CHAIRMAN—J. G. Bradley, *President, Elk River Coal and Lumber Company.* |
|---|---|
| **The Clearing House for Mining** | *By* J. G. Bradley, *President, American Mining Congress.* |
| **Flow of Minerals Into World Trade** | *By* J. W. Furness, *Chief, Minerals Division, Bureau of Foreign and Domestic Commerce, United States Department of Commerce.* |
| **Canada Now and In the Future** | *By* Hon. G. C. Bateman, *Secretary, Ontario Mining Association.* |
| **Mining In the Argentine** | *By* H. Bentley Mackenzie, *Former American Commercial Attaché to Buenos Aires.* |
| **Mining Conditions In South Africa** | *By* Perry J. Stevenson, *American Commercial Attaché to South Africa.* |

**9 A. M., THURSDAY, DECEMBER 6**

| Topic **TAXATION OF MINERALS** | CHAIRMAN—Jesse F. McDonald, *President, Downtown Mines Company, Leadville, Colo.* |
|---|---|
| **A Business Man's View of the Tax Situation** | *By* R. C. Allen, *Vice President, Oglebay, Norton Company.* |
| **The New Income Tax Regulations** | *By* Hon. E. C. Alvord, *Special Assistant to the Secretary of the Treasury.* |
| **Taxation of Income and Gains from Securities** | *By* H. B. Fernald, *Loomis, Suffern and Fernald.* |
| **Report—Progress of Government Studies of Mine Depletion Allowances and the Practicability of a Percentage of Income Basis for Determining Depletion** | *By* McKinley W. Kriegh, *Chief, Tax Division, The American Mining Congress.* |
| Discussion | |

**12.30 P. M., THURSDAY, DECEMBER 6**

**Luncheon Meeting—Board of Governors—Southern Division Luncheon for the Ladies**

**2 P. M., THURSDAY, DECEMBER 6**

**Introduction of Resolutions**

| Topic **THE COAL INDUSTRY** | CHAIRMAN—Archibald Douglas, *Douglas, Armitage and McCann, New York City.* |
|---|---|
| **The Coal Industry** | *By* H. E. Willard, *Secretary, United States Coal Company.* |
| **Coal's Relation to Government** | *By* J. D. Francis, *Vice President, Island Creek Coal Company.* |
| **How Anthracite Is Meeting Competition** | *By* A. B. Jessup, *Vice Pres. & Genl. Mgr., Jeddo-Highland Coal Co.* |

**5 P. M., THURSDAY, DECEMBER 6**

**Meeting of Members, The American Mining Congress, for Election of Directors and Report of Secretary**

**8.30 P. M., THURSDAY, DECEMBER 6**

**Informal Dance—Chinese Room, Mayflower Hotel**

**9 A. M., FRIDAY, DECEMBER 7**

**Introduction of Resolutions**

| Topic | |
|---|---|
| **MECHANIZATION** | CHAIRMAN—OTIS MOUSER, *President, Stonega Coke and Coal Company.* |
| **Mechanization and Human Progress** | *By* COLONEL M. C. RORTY, *Vice President, International Telephone and Telegraph Company.* |
| **What Mechanization Means to the Mine Operator** | *By* J. B. PAULEY, *Chairman of the Board, Miami Coal Company.* |
| **The National Committee on Mechanized Mining** | *By* DR. L. E. YOUNG, *Vice President, Pittsburgh Coal Company.* |

**12 NOON, FRIDAY, DECEMBER 7**

**Meeting, Board of Directors, The American Mining Congress, Suite ———, Mayflower Hotel**
**Luncheon Meeting, Coal Mine Ventilation, Standards Committee**

**2 P. M., FRIDAY, DECEMBER 7**

**First Meeting of the National Committee on Mechanized Mining, Dr. L. E. Young, Presiding (East Room)**

**Introduction of Resolutions**

| Topic | |
|---|---|
| **THE METAL MINER** | CHAIRMAN — ROBERT E. TALLY, *General Manager, United Verde Copper Company.* |
| **Strategic War Minerals** | *By* HON. CHARLES B. ROBBINS, *Assistant Secretary of War.* |
| **The Future of Copper** | *By* C. F. KELLEY, *President, Anaconda Copper Mining Company.* |
| **The Iron Ore Industry and Some of Its Problems** | *By* S. L. MATHER, *Vice President, Cleveland-Cliffs Iron Company.* |
| **The Future of Non-Metallics** | *By* B. MIFFLIN HOOD, *President, B. Mifflin Hood Brick Company.* |

**7.00 P. M., FRIDAY, DECEMBER 7**

| | |
|---|---|
| *Annual Banquet* | **Special Entertainment Features Dancing 10 P. M. to 1 A. M. Hotel Mayflower Orchestra** |
| *Addresses* | TOASTMASTER—WILLIAM LOEB, *Vice President, American Smelting and Refining Company.* |
| | HON. CARL D. MARSHALL, *of Mississippi.* |

**9 A. M., SATURDAY, DECEMBER 8**

**Report of Resolutions Committee**

| Topic | |
|---|---|
| **LEGISLATION AND INDUSTRY** | CHAIRMAN—J. B. WARRINER, *Vice President, Lehigh Coal and Navigation Company.* |
| **What the Outlook for Legislation Is** | *By* HON. TASKER L. ODDIE, *Chairman, Senate Mines and Mining Committee.* |
| **The Plight of the Gold Miner** | *By* HON. HARRY L. ENGLEBRIGHT, *of California.* |
| **The Inter-relation of Mining, Agriculture and Prosperity** | *By* HON. SCOTT LEAVITT, *of Montana.* |
| **Serving Industry Through the American Standards Association** | *By* WILLIAM J. SERRILL, *Chairman, American Standards Association.* |

**2 P. M., SATURDAY, DECEMBER 8**

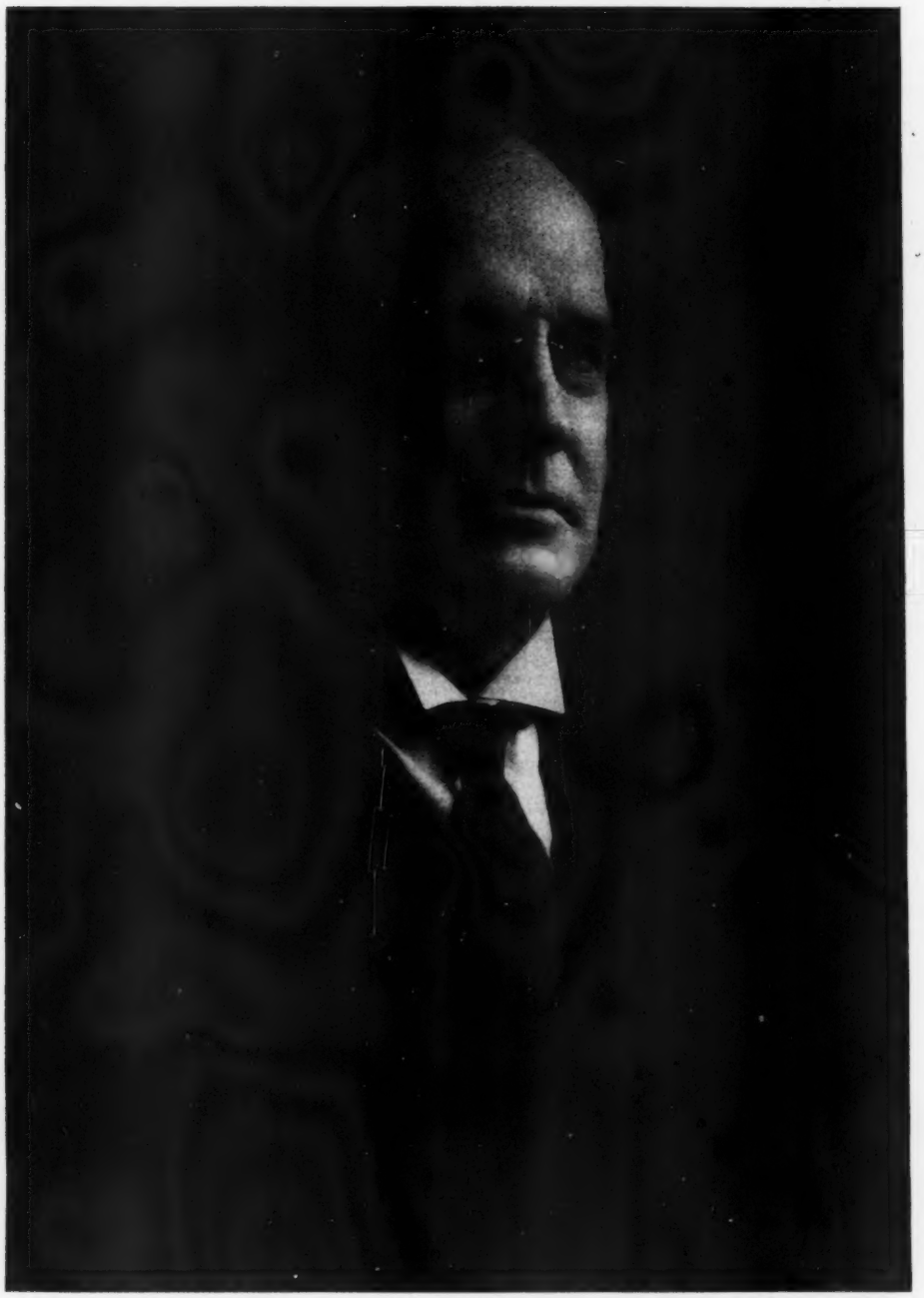
**Informal Standardization Conference, Under the Auspices of National Standardization Division of The American Mining Congress.**

COL. W. R. ROBERTS, *Supt. Ishpeming District, Cleveland Cliffs Iron Co.*

MR. LUCIEN EATON, *Chairman of the Board, Roberts & Schaefer Co.*

**Recreational Features**

*Golf privileges at Washington Clubs.*
*Luncheon to Delegates.*
*Reception and Dance.*
*Annual Banquet and Dance.*



*Sidney J. Jennings 1863-1928*

*Director and past president of The American Mining Congress*

# LEGISLATIVE REVIEW

## *LAST Session Of 70th Congress Convenes—Short And Busy Session In Prospect — Mexican Immigration Restriction Pressed — Mining Bills On Calendar — Extra Session After March Fourth A Possibility — Tariff Revision In Prospect*

AFTER A RECESS of six months, Congress reconvenes December 3 for the final session of the Seventieth Congress. Business left over from the last session, together with new bills which may be introduced, is on the legislative calendar for consideration. Owing to the shortness of the session, which must by law end on March 4, the ability of Congress to dispose of any considerable amount of general legislation is doubted. The right of way will be given to the appropriation bills for the support of the Government for the fiscal year beginning July 1, 1929, and such time as remains after their disposition will be devoted to the consideration of major legislative proposals. President-elect Hoover has stated that if Congress does not pass agricultural relief legislation at this short session he will call an extra session of the Seventy-first Congress to meet after March 4 to consider adequate measures for this industry. If such a session is called it would open the way for the introduction and consideration of all kinds of legislation. Should an extra session not be necessary, the next regular session of Congress would not meet until December, 1929.

President Coolidge will submit his sixth and final annual message to Congress at the opening of the new session, in which he will recommend the major legislative program of the session. Early in the session the House and Senate leaders will decide on the schedule for the legislative program. The Senate has as its unfinished business the bill already passed by the House providing for power development on the Colorado River. This measure was under debate when Congress adjourned May 29 last. Before closing that session the Senate authorized the Interior Department to appoint a board of engineers and geologists to report on the safety, economic and engineering feasibility, and the adequacy of the proposed structures and works involved in this project. This board was appointed and its report will be before the Senate when the bill is again taken up. Another measure slated for Senate consideration is a bill, already passed by the House, to subject goods mined or manufactured by convict labor to the laws of the states into which they are shipped.

Mining legislation is expected to receive consideration at the hands of the present session of Congress. The Joint Congressional Committee on Internal Revenue Taxation will consider the application of the percentage principle in determining mine depletion. The committee will have before it reports of its investigators on the subject, covering percentage depletion as applied to both gross and net income.

Should a tax revision bill be considered, the depletion matter would be taken up. Otherwise the change in the law would await the time when Congress again revises the tax law.

Tariff legislation is expected to be put over until the next session of Congress, when it is probable an upward general revision of the tariff will be undertaken. Pending proposals include a duty of 6 cents per pound on copper and $3 per ton on crude feldspar, and it is expected that renewed effort will be made to secure a duty of 30 cents an ounce on imported silver. Colorado mining interests are asking for an increase of 33 1/3 percent in the duty on lead.

### Mining Appropriations

Renewed activity will be undertaken by Congressmen from mining states for increased appropriations for the Bureau of Mines and Geological Survey for the purpose of providing more adequate service by these Government agencies in behalf of the mineral industries. Bills are also pending for the establishment of additional mining experiment and rescue stations in Utah, New Jersey, Oklahoma, Arkansas, Indiana, and Kentucky.

While there are a number of bills pending for the regulation of the issuance of mining and other securities, action on this legislation is not expected at the short session. The Federal Trade Commission will soon issue a report on the "blue-sky" situation as developed by a recent investigation conducted by it.

Renewed consideration will be given by the Senate Interstate Commerce Committee to proposed coal legislation. Following the extended hearings conducted at the last session into strike conditions in Ohio, western Pennsylvania, and West Virginia, the committee designated a subcommittee to consider proposed legislation. Senator Watson, Republican, Indiana, chairman of the committee and also of the subcommittee, introduced a bill suggested by the miners' union providing for regulation of the bituminous industry by a commission. The subcommittee is expected to take up the question in the new session, but final legislation is not expected during the short time at the disposal of Congress, because of the pronounced division of sentiment on the subject in both the Senate and House.

The proposal to restrict immigration from Mexico and other countries of the Western Hemisphere has been taken up by the House Immigration Committee in advance of the opening of the session. The committee was called to consider the bill on November 21.

### Congressional Changes

Vice President Charles G. Dawes, of Illinois, will preside at his final session of Congress this winter, as after March 4 he will be succeeded by Senator Charles Curtis, of Kansas. Representative Nicholas Longworth, of Ohio, will preside over the House as Speaker, and is likely to be reelected to that position in the new Congress meeting after March 4. A number of new Representatives and Senators will take their seats at the short session. L. L. Patterson succeeds W. B. Bowling, who resigned his House seat from Alabama. Otis F. Glenn becomes the new Senator from Illinois, replacing F. L. Smith, who was refused his seat. J. W. McCormick and R. B. Wigglesworth will succeed the late Representatives Gallivan and Frothingham, from Massachusetts. F. D. Culkin succeeds the late Representative Sweet, of New York; and E. F. Cooke will replace Representative MacGregor, of New York, who resigned in the middle of his term.

Representative Theodore E. Burton will succeed Cyrus Locker as Senator from Ohio. Mr. Burton has the distinction of having served two separate periods in both the House and Senate. Senator John (*Continued on page* 882)

# *The* COPPER INDUSTRY— *its* PROGRESS SINCE *the* WAR

*By* WM. G. SCHNEIDER †

***The Trend Toward Stabilization, Mass Production, And Possible Rationalization Of Industry In The United States—Copper's Campaign Back To Normalcy, What It Has Done In 1928 And The Outlook***

AS to what is the actual value of copper, or for that matter any metal or commodity, depends strictly on supply and demand. There are some considerations that underlie these main divisions and which have a material influence either on the supply or the demand. When I speak of the actual value of the metal being governed by supply and demand, I am referring not to a possible short time market condition but rather to a value that represents a balance between production and consumption. Such a balance may exist in any one year, or it may remain over a period of many years. It is absolutely certain that ultimately such a balance must come about. If the industry in question is not in a "stabilized" condition, or, in other words, the supply and demand are out of step, serious disturbances are sure to follow. The economic results of such disturbances most readily make themselves felt in the price of the commodity. In other words, if the supply of, let us say, copper is insufficient to meet the demand, we are sure to have rising prices for the metal. This tendency will continue until such time as sufficient metal is available, so that various producing units meet with difficulty in selling their production. Then as the price of the metal gradually drops, production falls off due to unprofitable operations on the part of the various units, and ultimately the balance is once more established. The reverse of this implies over-production, or what is almost the same thing from the standpoint of price—a falling off in demand.

*Wm. G. Schneider*

As a matter of fact, it is true, within limits, that over-production is a lack of demand for the excess. This condition indicates or presages a lagging industry that is bound to go into the depths further unless the proper steps are taken. Again, an insufficient supply may be interpreted as a pressing demand for the metal or product. Under these conditions rising prices are encountered and expansion, if possible, within the producing end of the industry naturally follows. In other words, we have either a buyers' or a sellers' market.

Till 1920-1922 the business pendulum was swinging back and forth as between these two conditions. Sometimes an industry was prosperous and then shortly afterwards in a bad way. Possibly quite a few years would elapse before the business cycle was completed. Such periods of depression and prosperity were more often prevalent in individual industries rather than in banking, although the banking business had its ups and downs, only its cycles were farther apart.

However, with the event of the Federal Reserve Bank and its assumption of "financial paternalism" it was only natural that industries as a whole should gradually effect within themselves a legal "stabilization." Gradually, during the coming years, those industries that have not recognized the necessity of such stabilization will come to it. Those industries that were left in a chaotic condition at the close of the inflationary period following the war were the first to take the necessary steps.

At that time I am sure it was difficult to foresee that the stabilization of industry would ultimately be general in the United States. Such stabilization has gained tremendous momentum and is now in the process of completion. It presages, if faithfully continued, a long period of prosperity. It is essential, however, that the individual units comprising any one industry do not kick over the traces. It is necessary that they follow that procedure which will tend, in their own minds, to keep supply and demand "balanced" and that there be neither an over-supply, with resulting falling prices, nor under-production with extreme rising prices.

It is further necessary that not only each unit but every industry as a whole exercise common sense and stay within the happy circle.

It is not the practice of these essentials to prosperity but the abuse of them that constitutes a violation of the Sherman Law or the Clayton Act.

This stabilization must be maintained if prosperity is to continue. Then two possibilities offer themselves if profits are to be increased, i. e.:

1. Lower cost production.
2. Stimulation of demand or larger sales volume.

(1) Lower cost production of raw material or finished product may be obtained through vertical integration, new processes or discoveries in the art, and the practice which is so prevalent today in American industry — mass production. Many industries as a whole, or individual units of such industries, the world over have completed the various steps here outlined and are now operating on a basis of mass production. Other industries, or even units of the same industry, are going through the various stages. Industry in the United States has reached, or is rapidly reaching, the stage where because of "mass production" it can compete in the world's markets at any price. What this mass production ultimately means would be indeed difficult to forecast. Certainly if foreign countries continue to purchase our products in quantity some method of payment other than the present must soon be worked out. If foreign countries protect their own industries by tariff walls, our present mass production, or a greater mass production, must fail of its full accomplishment. Our own tariff is an insurmountable wall to the "payment in kind" or in commodities. Let me ask, of what use is all the gold in the world if only the United States recognizes it as the basis of credit? Rationalization of

* Delivered before the American Inst. of Mining and Metallurgical Engineers November 22, 1928.
† Copper and Brass Research Association.

industry is difficult to foresee, but it may come about. Let us hope not.

A larger sales volume may obviously be obtained by stimulating the demand for the product. This may be accomplished in a variety of ways, one of which, advertising, should create a wider public knowledge of the merits of the product. Technical or commercial research methods relating to markets—research of consumption—in which the product is or may be used, are underlying props to such advertising efforts. Technical research relating strictly to production, if successful, usually means reduced operating costs, and may have a material bearing on sales volume. Sales promotion work is a highly specialized field and important to any company or any industry. Without such efforts, under competent and experienced direction, competitors in an industry will forge ahead at the expense of the backward organization. Competition between industries was never so keen as today. That industry which would hold its own and continue to show its regular increase in sales must be on its toes. Modern business has created the trade association which can handle the problems incident to:

(a) Technical research of consumption.
(b) Commercial research relating to markets.
(c) Necessary exploitation efforts.
(d) Development of new markets.
(e) Public and industrial relations efforts.
(f) Publicity.
(g) Advertising.
(h) Gathering of necessary statistics.
(i) Production problems, technical and otherwise.

All these efforts, within limits, are permitted by the Clayton Act or Sherman Law. They all relate to stimulation of demand or the building up of a larger sales volume.

The various steps mentioned are but links in the chain that go to make up a prosperous industry. The fact of the matter is that today each individual industry must sooner or later become "stabilized" to be prosperous. It is essential also that no important industry, as a whole, be out of step with this program. I strongly urge all those steps that are so apparent, and which if followed will result in success.

Keeping the foregoing in mind, I am sure it will prove interesting to take a look at "copper's book."

At the end of the inflationary period following the war, the copper industry was in a difficult position with extremely large stocks of metal above ground. This was in the form of refined copper, in process, scrap and material to be reclaimed. Stocks of refined copper exceeded 300,000 tons, and I do not think it would be a gross exaggeration to say that probably one billion and a half pounds of copper were available above ground. Opening up of mines and productive capacity all along the line was at least 10 years in advance of peace-time needs. At this time all production of any consequence ceased.

*William A. Willis, Manager, Copper and Brass Research Association*

Due to the war-time use of copper for munitions, markets that had used the metal were now closed to it and substitutes were everywhere being used. Only meager statistical information was available relating to the industry. Realization of the situation resulted in steps that have brought the industry back to its present position, which at this time is certainly encouraging.

The American Bureau of Metal Statistics was formed in 1919, and from then on has furnished statistics to the industry that have been of tremendous importance and help.

It became more apparent at this time that if the copper producer was to market his product and dispose of the large surplus, educational work was necessary to acquaint the consuming public with the merits of copper and its alloys. For this purpose the Copper & Brass Research Association was organized and started functioning in 1921. It has continuously carried on its work, and I am going to tell you something about its efforts and the results obtained.

Its advertising has been directed to the ultimate consumer, distributor, jobber, manufacturer, metal worker, architect, builder, engineer, and, in fact, to any and every one that might have occasion to consider the use of copper. Its propaganda efforts all along the line have met with an excellent response.

It has conducted commercial research surveys. There are many methods of compiling statistics. Such data as the association has gathered is based on actual facts and figures submitted to it. They are offered with the assurance that conservatism and accuracy were never lost sight of. Some industries recently investigated are:

The oil-heating industry, which uses about 5,000,000 pounds of copper per year. The use of such burners is increasing and affords an outlet for additional copper.

The automobile industry will use, in 1928, over 228,000,000 pounds. As the use of busses and trucks increases we may expect a corresponding increase in the quantity of copper used.

A new use for copper discovered in recent years is in the construction of burglar-proof bank-vault doors. Commercial copper and specially treated copper afford a means of making vaults practically impenetrable. A market for 50,000,000 pounds annually is indicated.

The radio industry will consume, in 1928, almost 30,000,000 pounds. Electric sets, and power speakers which are now really coming into their own, use considerable copper, and indicate an even larger consumption in the future. Television and new developments tied up with the radio industry offer possibilities for future tonnages.

The electric refrigerator, whose use is becoming more extensive year by year, is gradually consuming more and more copper, and in 1928 will use about 35,000,000 pounds.

Electrification of railroads in this country and abroad means outlets for the metal that will absorb a tremendous tonnage. The recently announced electrification of the Pennsylvania Railroad will require about 55,000,000 pounds of copper for the 1,300 miles of track.

Electrical development in this country and the world over is just coming into its own—and electricity means copper.

In building, copper, brass, and other copper alloys have made remarkable gains. In 1922, with a total building volume of $4,920,000,000, this industry consumed 164,000,000 pounds of copper. In 1926, with a building volume of about $5,500,000,000, copper consumption increased to 275,000,000 pounds, a growth of 111,000,000 pounds, or 68 percent. Some idea of the tremendous growth based on actual figures is given by the consumption of brass pipe. Previous to 1921 consumption of brass pipe for handling domestic water was negligible. In 1923 it had increased to 16,821,400 pounds; 1924, 25,828,500 pounds; 1925, 39,296,500 pounds; 1926, 53,446,800 pounds; 1927, 62,934,300 pounds; 1928, estimated, 75,000,000 pounds. (See Chart A.) The total percentage of in-

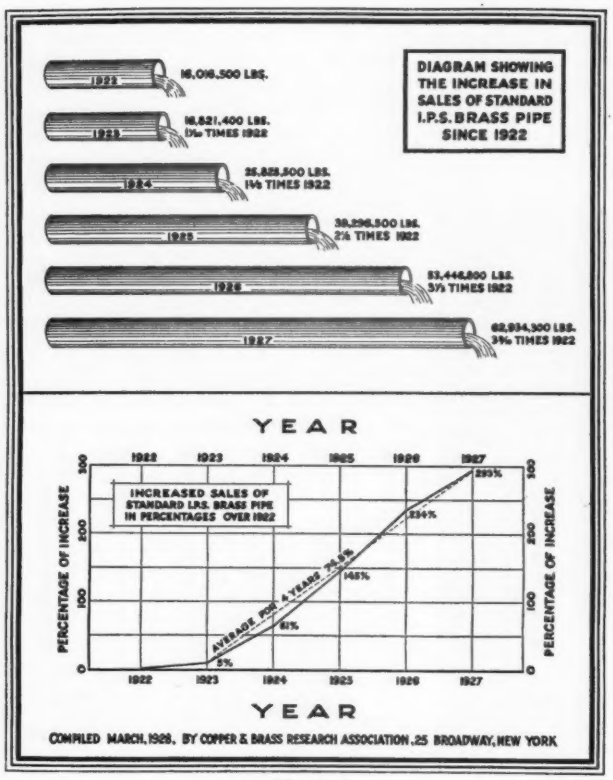


DIAGRAM SHOWING THE INCREASE IN SALES OF STANDARD I.P.S. BRASS PIPE SINCE 1922
1922 16,016,500 LBS.
1923 16,821,400 LBS. 1⅛ TIMES 1922
1924 25,828,500 LBS. 1⅝ TIMES 1922
1925 38,296,500 LBS. 2⅜ TIMES 1922
1926 53,446,800 LBS. 3⅓ TIMES 1922
1927 62,934,500 LBS. 3⅞ TIMES 1922
YEAR
INCREASED SALES OF STANDARD I.P.S. BRASS PIPE IN PERCENTAGES OVER 1922
AVERAGE FOR 4 YEARS 29.8%
5%
81%
148%
334%
393%
PERCENTAGE OF INCREASE
YEAR
COMPILED MARCH, 1928, BY COPPER & BRASS RESEARCH ASSOCIATION, 25 BROADWAY, NEW YORK

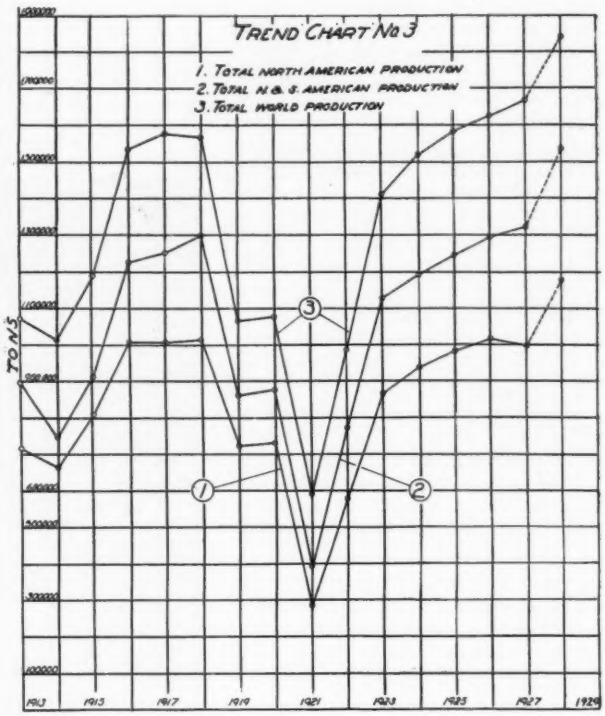



*Chart A*

crease in this period amounts to over 400 percent.

The Copper & Brass Research Association is continually seeking new markets for copper and its alloys which, as time goes on, will require a great deal of metal. Copper for radiators in the home will most certainly, in time, require a large tonnage, because of their reduced weight and smaller size as compared to cast iron.

Copper for locomotive fireboxes and flue tubes is an outlet of great importance. There are many other such developments that the association has under way. Problems relating to the welding of copper and its alloys have been given technical consideration, and this development means no small additional consumption of copper in many industries and for many purposes. There are many other problems that are having the attention of the association and which will, if successfully solved, go a long way toward increasing the consumption of copper and its alloys.

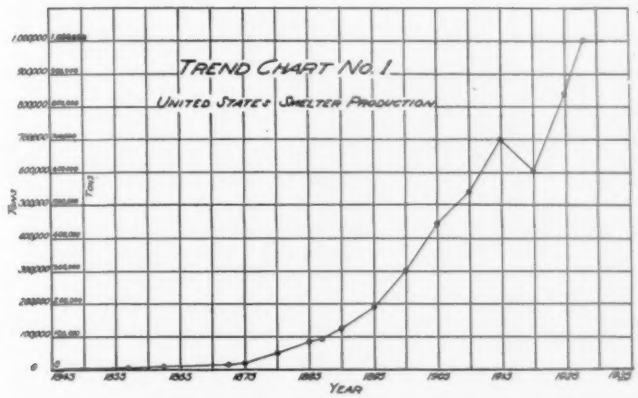
It is absolutely essential that existing markets be retained and consumption of the metal in them increased. It is just as important that new markets be developed to take care of increased production and also the tonnage lost to competitive industries. It is true with every metal or product that other metals or products will be developed from time to time which will prove more suitable or economical for certain uses, and will displace the material then in service. It is essential that every industry protect its markets and develop new ones. Not to do so will, sooner or later, bring regrets. It is a wise industry that will literally follow the old adage: "Make hay while the sun shines."

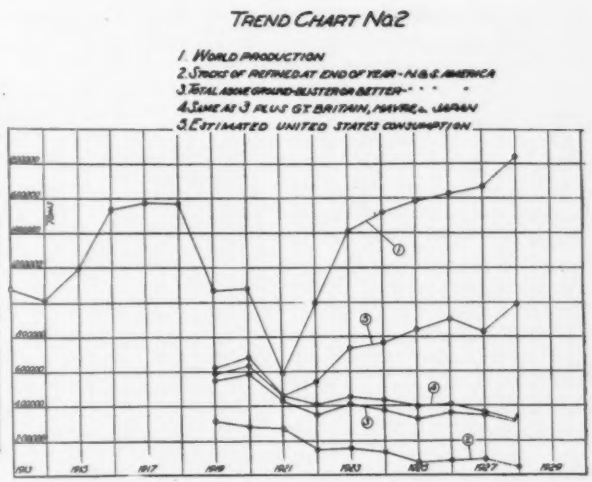
I have given you the foregoing meager details of the work of the Copper & Brass Research Association, not so much to show you what the association is doing, but rather to bring out one step in the rehabilitation of the copper industry.

Paralleling the work of the Copper & Brass Research Association in this country, in 1925 the Japanese Copper & Brass Research Association got going, and in 1927 the German Copper Institute was formed. The work of the German Copper Institute, with which I am fully familiar, based on work of the American association, has rendered that impetus to the German copper and brass industries which is of no small importance when considered from the standpoint of increased copper consumption abroad. Educational efforts of a similar kind are under way in France and in Belgium. The English copper and brass industries are also getting started and ultimately, when the entire machine is smoothly functioning, a great organizing effort will have been completed.

The Webb-Pomerene Act permits unified selling abroad. In 1926 the copper producers organized Copper Exporters, Inc., which soon had the foreign situation well in hand. It soon eliminated the influence exerted on the price of our entire production by about 100,000,000 pounds of standard copper. It is needless to say that with this corporation handling foreign sales certain service must be rendered to the purchaser, and in this respect Copper Exporters, Inc., has functioned perfectly. On every side one now hears praise regarding its activities and the wonderful manner in which it is handling an exceedingly difficult job. When it first started it was looked on with suspicion, especially abroad, but this feeling has turned to utmost confidence.

In November, 1927, the leading copper producers organized the Copper Institute. The purpose of this organization is "to aid the copper industry through wider knowledge and a clearer understanding of the economic factors affecting production, manufacture, distribution and consumption of copper, and copper products, and to further this object by creating an agency for the collection, compilation, dissemination and publication of accurate information concerning copper and copper products, and the industrial and commercial conditions bearing on the production, distribution, marketing, uses and consumption." The institute will also endeavor to "encourage the adoption of fair trade usages and practices to be followed in the copper business." It is





TREND CHART No. 2
1. WORLD PRODUCTION
2. STOCKS OF REFINED AT END OF YEAR - N. & S. AMERICA
3. TOTAL ABOVE GROUND-BLISTER OR BETTER-
4. SAME AS 3 PLUS GT. BRITAIN, FRANCE & JAPAN
5. ESTIMATED UNITED STATES CONSUMPTION

specifically understood that nothing is to be done that may in any way be contrary to the laws of this country. Commenting on the formation of the institute it was stated: "The formation of the Copper Institute * * * is expected to serve as one of the greatest stabilizing factors in the domestic market, since it will practically eliminate all guesswork and place the marketing of metal on a scientific basis."

With the American Bureau of Metal Statistics, the Copper and Brass Research Association, foreign trade associations interested in increasing the consumption, Copper Exporters, Inc., and the Copper Institute functioning is it small wonder that the copper industry is out of the rut and in a better condition than ever before, and that today the outlook is indeed reassuring not only to the industry itself but to the holders of its securities?

The individual units making up the copper industry have each striven to the utmost to effect a reduction in the cost of producing the metal and have achieved in this respect phenomenal results. Vertical integration has played its part; further steps in this direction are more than likely. Beyond question, the copper industry today is operating on a mass production basis as never before.

The tools with which the industry works are interesting, but more so are the results achieved and what they indicate at present and for the future. It is not my purpose to burden you with many statistics. The attached charts should be considered merely as indicating the trend. I believe that is what is really of interest to us. It is difficult, if not impossible, to forecast with any assurance future developments, because of possible new mines, competitive materials, curtailment or increase in the use of the metal in certain markets, and many other factors that have a vital bearing on any industry.

Chart 1 shows United States smelter output of copper starting with 1845. It is estimated that in 1928 the smelter output of copper will be about 1,010,000 tons. Between 1895 and 1905 smelter output increased about 200,000 tons, and between 1905 and 1915 about 240,000 tons. Between 1915 and 1925 the increase was about 140,000 tons. This is an average increase over 30 years of about 190,000 tons per 10-year period. At the present time the indications are that this demand for increased production will continue. As to whether or not we have the supplies or facilities to maintain this increase or a greater one, remains to be seen. Provided it is possible for United States smelters to increase their production, they should be producing at the rate of about 1,210,000 tons or more per year by 1935.

Chart 2. Graph No. 1 shows world production of copper from 1913 and including 1928. It is estimated that the world production of copper for 1928 will amount to about 1,840,000 tons. This is an increase of about 165,000 tons over 1927. Graph No. 2 shows the stocks of refined copper at the end of each year. It is believed that such refined stocks by January 1, 1929, will be slightly over 40,000 tons, taking into consideration advance sales, and if it is at all possible to prevent it, in no event will they go below this level.

Export shipments for 1928 also show an increase and will probably total about 700,000 tons.

From Graph No. 1 it is plainly indicated that the world production of copper must be increased. It is estimated by 1934 the world production of copper must be about 2,240,000 tons as compared to 1,840,000 tons for 1928. This means that the world will demand all the copper North and South America can produce from present mines, and will in addition be able to absorb all the copper which Africa can produce by that time, according to present plans. There is no question but what Africa is a great potential field capable of producing great quantities of copper. At the present time African copper fields lack capital for the proper opening, on a sufficiently large scale, of known large deposits. There are also transportation difficulties, and I am sure that there will eventually be some difficulty in obtaining sufficient labor at the right price if many properties start producing. In my opinion, African copper is not such a serious menace to the entire United States industry, but will be needed in the years to come to augment some of our own production. During the next few years a greater production of copper is absolutely essential from the Southwest, far West and South American properties. It certainly will be needed, other conditions remaining normal.

If, in the meantime, the demand for copper is pressing as during last October, the law of supply and demand will regulate the immediate price, as well as the price over a period of years.

Graph No. 3 shows the total copper above ground in North and South America in the form of blister or better. The difference between tonnages represented on graph No. 3 and graph No. 2, measured on the 1927 ordinate (January 1, 1928) is approximately 250,000 tons, and represents the copper in process, which, if the rate of production is to be maintained, can not be reduced. It will be noted that for 1928 (as of January 1, 1929) the tonnage difference as shown between graph No. 3 and No. 2 has increased to 300,000 tons. This is an estimated increase of 50,000 tons of metal in process. This is predicated on an increase in copper production of from 10 to 15 percent during the last month of 1928, and indicates that the mining end of the industry will be working 100 percent of capacity. The falling off of stocks during the year to an extremely low

point would certainly indicate that more production was needed in order to maintain the balance between demand and supply spoken of in the early part of this paper.

Graph No. 4 shows the total quantity of copper above ground as blister or better, not only of North and South America but also includes that above ground in Great Britain, Havre and Japan. It is significant that at the 1925 ordinate stocks in Great Britain, Havre and Japan amount to about 75,000 tons. Since then, January 1, 1926, such foreign stocks, made up principally of standard copper, have been gradually reduced until by January 1, 1929, they will, it is estimated, amount to about 10,000 tons. There need be no further anxiety as to standard copper in London having a material effect on the price of the entire production of the United States.

Graph No. 5 shows estimated United States consumption. It is believed that during 1928 the country consumed close to 1,000,000 tons of copper, which is an increase of 160,000 tons over 1927 and 100,000 tons over 1926. It is the largest tonnage of copper ever consumed by this country in any one year. This consumption of copper is sure to keep increasing unless the proper steps toward finding new markets or holding old ones are neglected. I feel that for a long time to come the copper industry will remember the past seven years and will not again let things "go by the board." The continuance of active sales promotion activities through its various associations is recognized by the leaders of the industry as absolutely essential and will be continued for many years to come.

Chart 3. Graph No. 1 shows total North American production, graph No. 2 total North and South American production, and graph No. 3 total world production. It is plainly indicated that North America is producing more copper than ever before, South America is producing more copper than ever before, and that the world is producing and consuming more copper than ever before. There is no indication that the world will produce less—or, in other words, consume less—in the immediate future; on the contrary, it is reasonable to expect greater production and consumption than ever before.

The foregoing data is based on figures compiled by the American Bureau of Metal Statistics, covering the first 10 months of 1928.

As copper and its alloys do not rust, a great deal of metal finds its way back as secondary metal. For every pound of new copper produced there is being handled in addition slightly less than one-half pound of secondary metal. As time goes on, the secondary metal situation will become even more important to the industry as a whole than at present.

There are markets for copper at any price, irrespective whether it is selling at 12, 13, 16, 18, 20 cents, or even higher. An increase in the price of copper does not necessarily mean that curtailment of use must follow. There are needs which only copper can supply, and here it will have to be used irrespective of price. There is also today a wider recognition of the merits of the metal, and it is hardly to be supposed that because the price advances the demand for it will fall off. If one was to consider the use of copper in any finished commodity, I am certain it will be found that the value of the metal figured, say, at 16 cents or higher, will have but a small influence on the retail selling price of the article in question. For instance, in an automobile selling around $1,500, an increase in the price of copper of 5 cents a pound, should only add about $3 to the cost of manufacture. In an adding machine selling for $250 the added cost would amount to about 15 cents, in an alarm clock selling at $4 it would add about 10 cents, and in a $15,000 house possibly $10. The sales value of copper and its alloys is firmly established for many purposes, and the purchasing public looks for the metal as an indication of quality and that value is being received. It is hardly to be supposed, therefore, that a few cents difference in the price of the finished article or commodity will deter a prospective purchaser.

From this look into "copper's book" we have seen how the industry has progressed for the last seven years. In 1921 there were large stocks of metal, no production, because it was unprofitable, outlets for the metal had been closed because of the use of substitutes. no new markets were in sight, and, in fact, the entire industry was demoralized. In 1928, after seven years applying the methods and practices previously mentioned, we find stocks of metal have been reduced to the point where the situation is, if anything, acute, production is 100 percent of capacity at the end of 1928, many markets that turned to the use of substitutes are now again using copper, many new markets have been developed, or are in the process of development. In fact, I can say that at this time there is no single cloud in sight that would indicate that there was anything but prosperity in store for the copper industry for some time to come. The very agencies which brought about this prosperity will, if kept going, assure continuous prosperity.

Looking back at 1921 in 1928, it can truly be said, especially of the copper industry, that "the worst that can happen to you, is the best that can happen to you, if you don't let it get the best of you."

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**LEGISLATIVE REVIEW**

(*From page* 877)

Thomas will succeed the late Senator Gooding, of Idaho. R. R. Butler will succeed Representative Sinnott, of Oregon, who became a judge on the Court of Claims. Joseph Walfenden will succeed the late Representative Butler, of Pennsylvania.

The following Senators and Representatives will retire after March 4:

Senators.—McLean, Conn.; Bayard, Del.; Bruce, Md.; Reed, Mo.; Edwards, N. J.; Gerry, R. I.; Mayfield, Tex.; and Neely, W. Va.

Representatives.—Tillman and Reed, of Ark.; White, of Colo.; Sears, of Fla.; Major, of Ill.; Gardner and Updike, of Ind.; Vincent and Boies, of Iowa; Anthony and White, of Kan.; Ware, Moore, Moorman, Chapman, Gilbert and Vinson, of Ky.; Hersey, of Me.; Cole, of Md.; Bowles, of Mass.; Furlow and Carss, of Minn.; Lowrey and Wilson, of Miss.; Combs, Dickinson, Major, Williams, Fulbright and Rubey, of Mo.; Shallenberger, of Nebr.; Morrow, of N. Mex.; Kindred, Cohen and Jacobstein, of N. Y.; Lyon, Bulwinkle and Weaver, of N. C.; Tatgenhorst, W. T. Fitzgerald, Fletcher, Begg, McSweeney and Davey, of Ohio; Howard and Swank, of Okla.; Palmer, Bushong, Kent and Morin, of Pa.; Monast, of R. I.; Garrett, of Tenn.; Black and Blanton, of Tex.; Deal, Harrison and Peery, of Va.; O'Brien, England and Strother, of W. Va.; Beck and Berger, of Wis.; and Winter, of Wyo.

O. A. Larrazolo will be Senator from New Mexico during the short session, replacing Senator Bronson Cutting, who was appointed by the governor. Mr. Cutting will resume his Senate seat March 4 for a six-year term.

Other new Senators taking office March 4 will be:

F. C. Walcott, of Conn.; J. G. Townsend, of Del.; P. L. Goldsborough, of Md.; R. C. Patterson, of Mo.; H. F. Kean, of N. J.; Felix Herbert, of R. I.; Tom Connally, of Tex., at present a Representative; and Henry D. Hatfield, of W. Va.

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Bitumen deposits under the Great Salt Lake, in Utah, may be developed into rubber substitutes, for the production of hard rubber articles, such as battery boxes, according to Dr. Julius Klein, of the Bureau of Foreign and Domestic Commerce. He says there are 2,000 acres of this bitumen from which a compound can be produced at one-fourth the price of crude rubber.

# SAFETY WORK *in the* GLOBE MIAMI DISTRICT*

*Globe Miami District Mine Rescue Station*

## *CO-OPERATIVE Maintenance By Operating Companies In The District—Systematic Training, Complete Equipment And Constant Service Provided—Results Attained Show Marked Efficiency And Large Number Trained*

UNTIL 1918 the several companies of the Globe-Miami District each maintained mine rescue apparatus, and training in first aid to the injured was done by their medical departments. To maintain such equipment and training was in most cases part time duty, and therefore inadequate. And for any one company to have provided the necessary organization for maximum protection would have entailed prohibitive outlay.

By combining all equipment into a single unit, the cost per company was lessened and the available facilities greatly increased. During January, 1918, the Old Dominion Company, International Smelting Company, Inspiration Consolidated Copper Company, and the Miami Copper Company formed the Globe-Miami District Mine Rescue and First Aid Association, the Board of Directors being comprised of the chief executives of each company. The station was completed, equipped and started operation with full crew on January 1, 1919.

The purpose of the association is to provide training and facilities for the employes to render prompt and efficient aid at times of injury, to aid in every possible way in fire prevention, and to keep a complete organization, fully trained in the use of oxygen breathing apparatus, with the responsibility of keeping such equipment in condition for immediate use.

The member companies bore the initial expense in the same proportion as the average number of shifts worked, during a normal six months' period preceding, to the total number of shifts worked for all companies during the same period.

The maintenance cost is paid in the same manner except that in the rescue expense, only the shifts of the mine departments are considered. The basis of these total shifts is the average for the preceding month.

The directors have voting power in the same proportion as dollars contributed to maintenance for the preceding month.

During 1920 the service was extended to include the Iron Cap Copper Company, the Superior and Boston Copper Company, and the Arizona Commercial Mining Company, the membership fee being based on the number of employes, and subsequent maintenance cost as described above.

*Typical Scene at Maneuvers*

The accounting, purchasing, shop work, lights, water, etc., are handled through the nearest company departments at a nominal service charge.

A comparative table for 1920 and 1928 is shown on the following page.

The director, handling all executive work and training, is also responsible for the care of all apparatus and serves as chief of crews.

Three station attendants work in 8-hour shifts and change shifts every two weeks. They inspect and re-stock equipment monthly, keep up all supplies, prepare bandages and compresses, and care for the station grounds and equipment. The director's residence is part of the station, so that every minute of the 24 hours finds instant service available.

When fire calls are received the director and one attendant answer the call with the apparatus truck and one light truck. Another attendant phones the apparatus men and stands by, ready to load auxiliary apparatus and supplies if needed.

The director proceeds to the scene of the fire with a mine official (providing exploration can be done with one-half hour oxygen breathing apparatus) while the attendant organizes the first five-man apparatus crew.

Additional crews are organized as the men arrive, and all emergency supplies prepared for delivery where needed. If it is necessary to take apparatus into the mine, the director with the four crew men most familiar with local conditions, makes the first exploration trip and reports back by phone or messenger. In cases of doubt, the plan of procedure is reached by consultation with officials of the company.

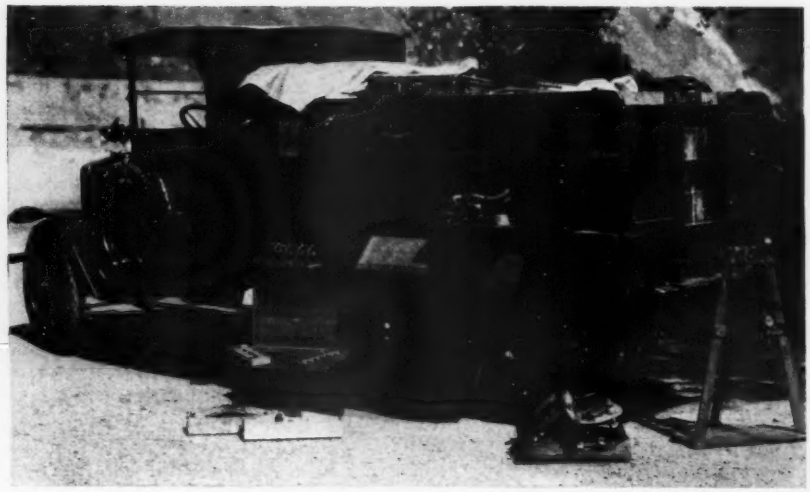
The station personnel and service is at the disposal of the officials of all companies for any purpose within its field at all times. No other act than regular routine is taken without consulting the proper officials.

All expense of emergency supplies and crews is charged to the company requiring the services.

The station employes are on salary with annual vacation, providing it is not

* Material furnished by Orr Woodburn, Director, The Globe Miami District, Mine Rescue and First Aid Association.

Compiled and edited by Dr. Henry Mace Payne, Consulting Engineer, The American Mining Congress.



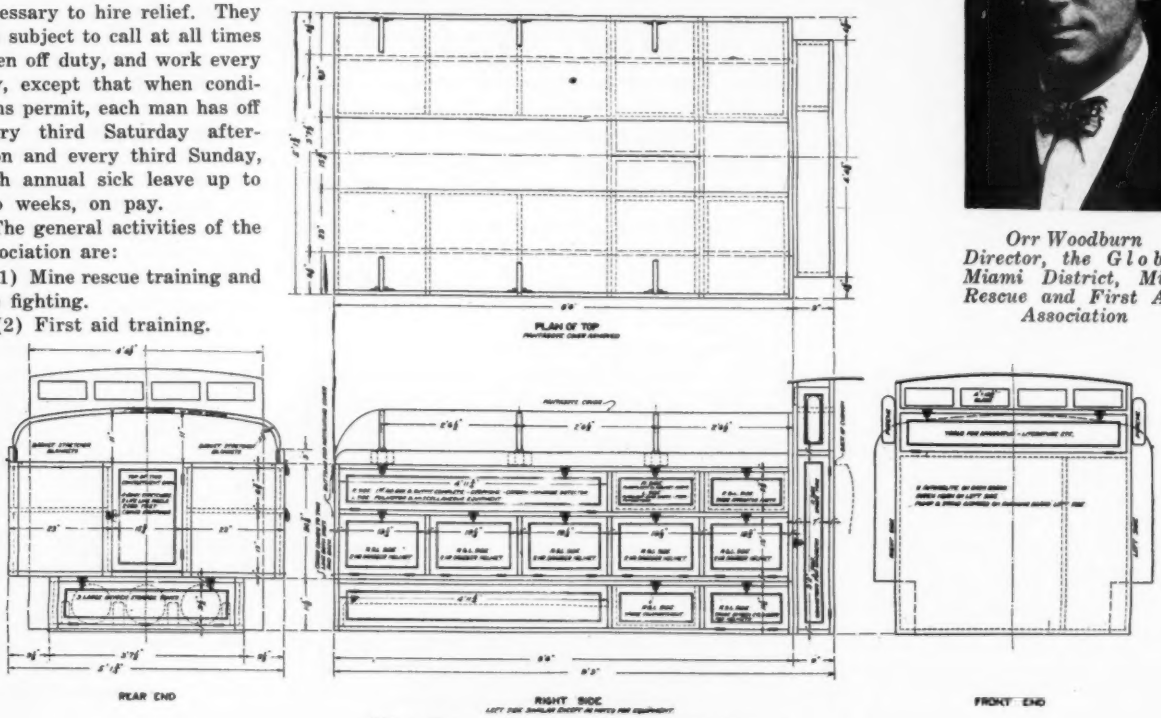
*Mine Rescue Truck*

necessary to hire relief. They are subject to call at all times when off duty, and work every day, except that when conditions permit, each man has off every third Saturday afternoon and every third Sunday, with annual sick leave up to two weeks, on pay.

The general activities of the association are:

(1) Mine rescue training and fire fighting.

(2) First aid training.




*Mine Rescue Truck—Body and Equipment*

(3) Conducting "District Safety Week (s)" (a wide variety of striking posters, cards and literature have been prepared for use in these movements).

(4) Answering emergency calls for resuscitation with or without a doctor.

(5) Using or furnishing breathing apparatus for purely industrial purposes.

(6) Organizing a Southwestern Mine Safety Association.

(7) Mine rescue, first aid, and safety conferences of safety men and mine officials of the Southwest.

(8) Organizing and acting as hosts to sectional meetings of the National Safety Council, and reporting the proceedings.

(9) Holding mine rescue maneuvers for local association and crews from elsewhere, on invitation. (11 maneuvers in 28 days.)

(10) Cooperation with other mines in Arizona at time of mine fires.

(11) Furnishing consultation to outside plants in times of emergency.

(12) Maintaining and furnishing pure oxygen, and oxygen 95 percent carbon dioxide 5 percent for inhalation purposes, to local members of the medical profession without cost.

(13) Aid in all civic movements and in entertaining district guests and conventions.

(14) Giving city firemen apparatus training every six months.

*Orr Woodburn*
*Director, the Globe-Miami District, Mine Rescue and First Aid Association*

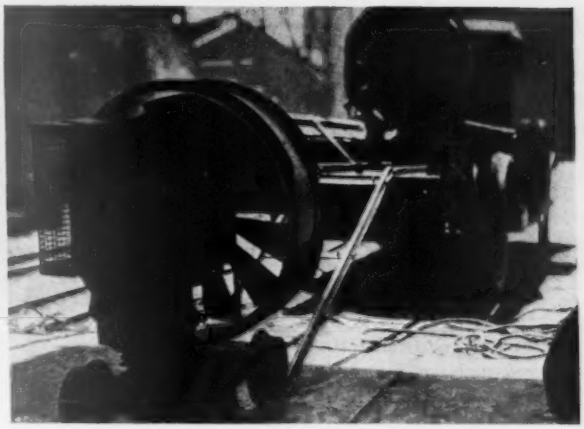
The Mine Rescue Station, shown herewith, is situated on the Globe-Miami highway near Globe, and close to the Old Dominion Company shaft. The farthest removed company in the association is only 33 minutes from the station by rescue truck.

The building is one story high, of hollow tile with tile roof. The apparatus room is 24 x 35 ft., with pit, wash rack, and two large doors opening onto the highway. There is a completely equipped office 11 x 13 ft., and a shower and locker room 9 x 11 ft.

The directors' living quarters consist of a living room, two bedrooms, dining

| Company | Average No. of Employees 1920 | 1928 | Miles From Station | Minutes to reach |
|---|---|---|---|---|
| Inspiration Consolidated Copper Co. | 1,425 | 1,708 | 7.9-9.5 | 25-33 |
| Miami Copper Co. | 1,248 | 1,129 | 5.7 | 17 |
| Old Dominion Co. | 895 | 691 | 1 | 4 |
| International Smelting Co. | 426 | 269 | 5 | 14 |
| Arizona Commercial Mining Co. | 217 | 95 | 3.5 | 14 |
| Iron Cap Copper Co. | 233 | ... | 4.0 | 17 |
| Superior & Boston Copper Co. | 91 | ... | 4.7 | 20 |

*Light truck for fans and auxiliary work*



*Fans being loaded onto Auxiliary Truck*

room, kitchen, bath, laundry, entrance hall and porch.

Warehouse facilities consist of one 9½ x 6½ ft. fan house, and a 9 x 18 ft. warehouse adjacent to the station. Reserve supplies are stored at the Old Dominion Company warehouse. Sufficient supplies, spare parts, paints, large tools, spare oxygen pumps, etc., are provided, with 32 sets of 2-hour oxygen breathing apparatus and spares for instant use. Sufficient supplies and spare parts are on hand at all times to serve for 200 hours continuous use of all equipment.

The truck room has a work bench 22 ft. long, with tool drawers and cupboards equipped with every possible necessary tool or device.

The motor equipment consists of a one-ton special mine-rescue truck, a one-ton light special truck for fans and auxiliary work, and three passenger cars.

The special mine-rescue truck is shown on the preceding page. It weighs, loaded, 6,650 pounds, and is 17½ ft. over all.

The special fan truck, shown above, remains unloaded at the station and is used as an auxiliary truck which can also be employed to transport two 36-in. disc-type mine blowers. The fans in the fan house set on rails in this truck, being held in place by turnbolts fastened to eyebolts in the truck bed. Another photograph shows these fans being loaded onto the auxiliary truck.

A high pressure oxygen re-fill pump is mounted on the running board of this truck, and any additional supplies can be loaded or delivered with minimum delay.

The general process of training is as follows:

(1) The men report at their own plant at a convenient time for a 2-hour period daily for 5 to 6 days, usually 2 hours before or after the 3 p. m. change.

(2) The station apparatus truck accompanied by the director, meets and instructs the men.

(3) Men are shown and taught a questionnaire, consisting of 187 graded questions, and 11 precautions for use around the apparatus. They are then shown the supplies and their location on the truck.

(4) The scheme of the district organization is outlined to them, together with their own responsibilities and those of their company.

(5) Individual history cards are then filled out, the circulation of the apparatus and its mechanics defined, and the employe is given facts about the apparatus to learn.

(6) As he progresses in training, he is furnished a schedule of mine rescue and recovery operations, and other United States technical papers and Mines Bureau circulars, pertaining to rescue and recovery.

(7) He then wears the apparatus from 15 to 45 minutes daily, and learns to clean, dissemble and assemble it.

(8) The use of high-pressure re-fill pumps is taught, and of fire extinguishers and how to re-fill them.

(9) Fire regulations of the various member-companies are distributed, and the last day of the training is devoted to the half-hour cabinet and its equipment.

Throughout the course, the director gives informal talks on fire fighting and rescue work. The history cards are revised as needed, with new ones every 6 months.

Physical examination is required every 6 to 9 months, and training is continued until every man can pass the questionnaire 100 percent.

Three times a year, maneuvers are held for the entire district bonus-crew. Preceding these maneuvers by about a week, each man receives a two-hour training period at his own plant.

Lists of crews and rules for each mine are listed at all mines, and revised every 15 days if needed. A geographical chart of residence of crews is maintained at the station.

Oxygen inhalators for hospital and doctors are made from obsolete material and are found to be very satisfactory.

*Typical First Aid Service, Globe-Miami District Mine Rescue and First Aid Association*

Many typical instances have occurred since the organization of the association where the service has been invaluable. In one case 27 men were rescued, by rescue men 277 hours under oxygen, with a total rescue time of 1,008 hours, and rescue men on patrol for 288 hours. The total cost of supplies and labor was $978.99, and of the rescue crew's time $1,317.55, total $2,296.54.

It has been the policy of the association to send the director, and where possible, some of the bonus-crew men to mine fires in the state, and to send the director to major fires or disasters in any of

the western states. Other plants in the state are invited to send their crews to participate in the maneuvers, which are also attended by United States Bureau of Mines crews and cars, assisting in every way possible.

All apparatus is overhauled yearly and tested by wearing, besides bench tests.

The 1927 cost-price inventory was as follows:

| | |
|---|---|
| Mine rescue equipment | $9,347.70 |
| Mine rescue supplies | 9,813.46 |
| First aid supplies | 2,263.68 |
| Building complete | 14,914.97 |
| Station and grounds | 1,284.24 |
| Station fixtures | 2,605.62 |
| Station supplies | 451.53 |
| Cars and accessories | 6,880.49 |
| Tools | 604.36 |
| | $48,166.05 |

Individual company equipment was:

| | |
|---|---|
| Old Dominion Company | $1,225.79 |
| Miami Copper Company | 920.88 |
| Inspiration Consolidated Copper Co. | 1,536.21 |
| Arizona Commercial Mining Co. | 243.17 |
| Iron Cap Copper Company | 361.45 |
| Superior & Boston Copper Co. | 213.17 |
| | $4,500.67 |

Aggressive first-aid work is carried on, the training for which consists of five 2-hour periods. After completing the course the members are eligible to compete in a team of six men for bonus prize money. Cash bonuses amounting to $27,280 have been paid out at Globe, Miami, Lower Miami and Inspiration, between January, 1921, and April, 1928. Seventy-seven first-aid bonus contests have been held, with 291 teams competing.

All emergency cabinets at the various mines are tested and inspected at least twice monthly, and when used.

The first-aid boxes, of which there are 130 on the surface and 174 underground are in some instances cared for by the company. All underground boxes are so attended, and the 95 boxes maintained and restocked by the association have averaged 10 inspections per year for 7 years.

The 10 first-aid supply bases have averaged an inspection every 13 days for 7 years.

Monthly and yearly reports are made to the directors of the association and to participating company officials, covering all activities, calls, training, inspections, etc. The companies receive on January 1 of each year, the name of every man on their payrolls having had first-aid training, and a detail of when and how much.

The 1927 annual report of the association is not yet available on account of the heavy schedule of first-aid training during the present year, which occupies the director's attention. The above figures, however, covering the years 1924-1927 inclusive, and the first three months of 1928, are indicative of the extent of the association's work.

**FIRST AID**

| | 1924 | 1925 | 1926 | 1927 | 3 months 1928 |
|---|---|---|---|---|---|
| Total men trained | 1,071 | 1,018 | 2,202 | 667 | 1,755 |
| Total attendance | 4,328 | 4,740 | 8,089 | 2,157 | 6,979 |
| Total classes held | 265 | 299 | 313 | 137 | 142 |
| Total hours training | 446 | 524 | 556 | 228 | 381 |
| Total District buttons issued | 358 | 137 | 367 | 82 | 378 |
| Total U. S. Bureau of Mines Certificates | 252 | ..... | ..... | ..... | 220 |
| Total District button men | ..... | ..... | ..... | ..... | 2,183 |
| Total U. S. Bureau of Mines Certificate Men | ..... | ..... | ..... | ..... | 1,147 |

**MINE RESCUE**

| | | | | | |
|---|---|---|---|---|---|
| Total men trained | 107 | 76 | 112 | 92 | 35 |
| Total hours training | 2,790 | 1,115 | 1,502 | 978 | 198 |
| Average hours per man | 26.07 | 14.67 | 13.41 | 10.63 | 5.66 |
| Total practices held | 56 | 50 | 62 | 58 | 21 |
| Total practice hours | 690 | 112½ | 126 | 240 | 36 |
| Total attendance | 712 | 285 | 338 | 375 | 42 |

## U. S. CONSUMES LARGE AMOUNT OF PRIMARY TIN

The consumption of tin in the United States is so large that the annual imports amount to about one-half of the world's production of that metal, according to the United States Bureau of Mines, Department of Commerce. As the result of a canvass made to ascertain the amount of tin consumed for different purposes in the United States during 1927, the Bureau found that 24,527 long tons of primary or virgin tin were used in the manufacture of tin plate and terne-plate, accounting for 35.65 per cent of the total consumption of primary tin in the United States in that year. Next in order of magnitude as a consuming factor is solder, which required 13,734 long tons, or 19.96 per cent of the total. The manufacture of babbitt required 8,705 long tons, and foil and collapsible tubes consumed 6,903 long tons. The results of the Bureau's inquiry, wherein effort was made to eliminate figures relating to secondary tin, account for 68,797 long tons of primary tin.

The results of this canvass, based on reports from 1,050 concerns, are tabulated in Information Circular 6084, "Consumption of Primary or Virgin Tin in the United States," by J. B. Umhau, copies of which may be obtained from the United States Bureau of Mines, Department of Commerce, Washington, D. C.

## PRODUCTION OF MAGNESIA AND SILICA CRUCIBLES IN THE INDUCTION FURNACE

The production of silica and magnesia crucibles in the induction furnace has been achieved in the laboratory of the Pacific Experiment Station of the Bureau of Mines, Berkeley, California. The essential new parts of this work are the development of a technique for the high-frequency furnace production of silica crucibles of greater wall thickness than could be readily fabricated from commercial fused silica, and for heavy-walled magnesia crucibles of great density and mechanical strength. A description of the method employed, which produced crucibles of excellent quality in a reasonable time and with a moderate expenditure of power and materials, is given in Serial 2896, by C. N. Schuette, recently published by the Bureau of Mines.

## FERROUS OXIDE FROM IRON AND MAGNETITE

A description of experimental procedure in the production of ferrous oxide from iron and magnetite, conducted at the Pacific Experiment Station of the Bureau of Mines, Berkeley, California, is given in Serial 2898 by C. Travis Anderson. A recent critical study made by the Bureau of Mines of the iron system points out the necessity for work upon the preparation of pure ferrous oxide. Not only are ferrous oxide samples desired for determination of the important physical and chemical properties, such as specific heats and heats of formation, but also information on the stability and behavior of this material is of considerable technical importance. Related problems where the properties of ferrous oxide are important have to do with desulphurization of iron, the formation and occurrence of magnetite in copper smelter slags, and sulphur elimination in copper smelting.

## HEAVY LIQUIDS USED IN ORE TESTING

Heavy liquids have come into use in ore-dressing investigations, as they make possible the separation of an ore into its specific-gravity components. Some heavy liquids become discolored after use, and the lack of transparency impairs their value. Since they are expensive, it is desirable to reclaim them. In Serial 2897 by R. G. O'Meara and J. Bruce Clemmer, recently issued by the United States Bureau of Mines, Department of Commerce, methods of preparing and cleaning some common heavy liquids used in ore cleaning are discussed. The liquids discussed are acetylene tetrabromide, methylene iodide, thallium formate, and thallium malonate-formate.

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© Ernest L. Crandall

*The Capitol, majestic, rugged and of beautiful simplicity—*
*a fitting symbol of the country for which it stands*

# ANTHRACITE BUREAU *of* INFORMATION

*By* EDWARD W. PARKER* *and* C. W. HARE†

FOR a score of years or more following the surrender of the Confederate General Lee at Appomatox and the establishment of peace between the belligerent states, the anthracite industry of Pennsylvania was in a state of demoralization akin to that which has been the part of the bituminous coal-mining industry since the termination of the World War. Overdevelopment of anthracite properties, with the consequent and natural result of overproduction, demoralized prices and bankrupted more than one anthracite-producing company. And just a half a century ago, or in 1878, in addition to the other woes from which the industry was suffering, even the hand of the weather man was turned against anthracite, as it has been this year and in 1926 and 1927. For we read in the *Coal Trade Journal* of March 13,1878:

"Owing to the poor demand resultant from the mild weather that had predominated recently throughout the land, the collieries of all companies in the Lackawanna and Wyoming regions are running on partial time; this seems to exert a potent influence against any large purchases and this adds much to the general uncertainty now prevailing in the coal trade."

In the preceding month of February the Delaware, Lackawanna & Western Railroad (for in those days of anti-prohibition against the carriers the railroads could not only transport coal but mine and sell it) sold 50,000 tons of anthracite at auction at prices which indicate that the cost of production was in excess of the realization. Egg coal brought $3.15½ a long ton; stove coal, $3.55; and chestnut coal, $3. Even these prices were better than some that had previously been in effect, for the record of 1877 shows that anthracite had sold in that year at New York Harbor as low as $2.50 a gross ton, and in 1879 coal was actually sold at lower prices than this. Naturally, such conditions of cutthroat competition making for bankruptcy, not only for the anthracite industry but the railroads as well (for the railroads owned or controlled from 75 to 80 percent of the anthracite production) could not continue. The first attempt at its correction on the part of the executives of the railroads was the formulation of an agreement by which certain percentages of the tonnages were assigned to the different carriers. This agreement on tonnage percentages, which had for its object the restriction of production and a stabilization of prices, seems to have been loosely held, and conditions were not materially improved notwithstanding that the last 20 years of the nineteenth century were notable for attempts to effect a workable understanding. In 1890 the New York, Ontario & Western Railroad adopted the somewhat unique plan of purchasing the coal mined on its line and paying for it on the basis of 60 percent of the prices realized at New York Harbor. The other roads adopted the same plan, the mining companies independent of the railroads, after 10 years of effort, finally securing an advance in their percentage to 65 percent, and at the beginning of the present century what came to be known as "the 65 percent contracts" became effective. They were set aside by the United States Supreme Court in 1912.

In the attempt to carry out the agreement on tonnage percentages the anthracite-carrying roads established in 1876 "The Bureau of Anthracite Coal Statistics," with the late John H. Jones as chief of the bureau. Mr. Jones was succeeded by William W. Ruley in 1890. Ruley died in 1910 and was succeeded by A. H. Armstrong. As a result of the statistics collected by this bureau we have the complete record of anthracite shipments by months and carriers since 1890. The bureau also compiled the statistics on prices at New York Harbor on which the settlements under the 65 percent contracts were made. From these records of prices also were determined the bonuses to be paid the mine workers each month under the sliding-scale arrangement, which was one of the awards of the Anthracite Coal Strike Commission of 1902. The sliding scale was, by mutual consent of operators and miners, abolished in 1912, the same year that the 65 percent contracts were abrogated by the United States Supreme Court.

The attempts of the anthracite producing and transportation interests to stabilize the industry met with determined opposition on the part of the public, the press, and the authorities, and were the cause of attacks from every conceivable angle by the Federal and State governments, legislative, administrative and judicial, culminating eventually in the segregation, whether justly or unjustly, of the railroad and mining interests.

## *ACTIVITIES Of Bureau Outlined—Furnishing Of Trade And Statistical Information To Operators And Public Chief Function—Created In 1915—Anthracite Coal Service*

The Anthracite Bureau of Information was established by the anthracite-producing companies in 1915, and the Bureau of Anthracite Coal Statistics, previously maintained by the railroad companies, passed out of existence, its personnel and records being merged into the new bureau, Mr. Armstrong, the then head of the Bureau of Statistics, becoming the secretary of the Anthracite Bureau of Information. The

* Director, Anthracite Bureau of Information, Philadelphia, Pa.
† General Manager, Anthracite Coal Service.

offices of the new bureau were originally located at Wilkes-Barre, but were moved to Philadelphia in 1918.

In a previous article[1] the writer recounted the activities of the Anthracite Bureau of Information during and immediately following the World War, and of the services rendered to the Wage Negotiating Committee previous to and during the strike of 1922. It is not necessary or advisable to restate them here. Services similar to those rendered to the wage negotiators in 1922 were performed in 1925, a year made notable by its prolonged, disastrous, and entirely useless strike, which had but one redeeming feature, the signing of an agreement which insures peace in the anthracite region for five years, or until August 31, 1930. In these piping times of peace, industrial and otherwise, the Anthracite Bureau of Information is not called upon to put forth any extraordinary efforts, but it manages to find enough to do, the director hopes, to keep out of mischief. At the present time it is engaged in collecting special information for the use of committees of the Anthracite Operators' Conference on safety work and first aid, stream pollution, mine timbering, etc. Under the supervision of the bureau, by direction of the Anthracite Operators' Conference, systematic inspection of anthracite when loaded on cars for shipment has been under way for the best part of a twelvemonth, daily reports of these inspections being made to the bureau, which assembles them, mimeographs the result, and distributes them every few days to every operator submitting to the testing program. Without any attempt at persuasion or coercion, the simple passing of this information has resulted in a more uniform sizing, particularly in the preparation of chestnut and pea coal than has ever heretofore been attained, as witness the statement made by Mr. G. W. F. Woodside, secretary, of the New York State Retail Coal Merchants' Association, at the meeting at Saranac Inn, September 14 last, to the effect that "They (the anthracite operators) are putting out what is agreed by all to be the best prepared anthracite that has ever gone on the market." And that statement, made before a meeting of some two or three hundred retail coal dealers, was unchallenged.

Through the cooperation of the anthracite-carrying railroads the Anthracite Bureau of Information compiles and distributes to the various new agencies the monthly record of anthracite shipments by carriers. It also compiles each month the statistics of commercial production, storage, labor employed, local strikes or suspensions, and, at the request of the Federal Reserve Bank of Philadelphia, has for the past year been compiling statistics on employment and wages which are published by the bank in the form of index number percentage changes from month to month.

When in April, 1917, the United States became involved directly in the World War, the stimulation of production and the efficient distribution of coal, both anthracite and bituminous, became of paramount importance. As an initial step and acting in the interest of the Council of National Defense, statistics were collected by the Anthracite Bureau of Information showing the quantity of anthracite that had been shipped in the coal year 1916-17 to every community in the United States, and upon the record thus obtained the supply of anthracite during the period that the industry was under Government control was equitably allotted and distributed; provision, of course, being made for increased Government needs and for the requirements of those industries engaged in the manufacture of the munitions of war.

These records of distribution were found of great value in allotting and distributing the tonnage that became available with the resumption of mining after the 5½ months strike in 1922, the director of the Anthracite Bureau of Information being designated for that emergency period as the director of anthracite distribution. And again it is gratifying to be able to state that every community got its allotted quota.

Market conditions during the current year have been such that a demand was created for reliable information as to the flow of the product from mines to consumer, and in response to that demand the Anthracite Bureau of Information undertook a study of the distribution of anthracite during the last four coal years to a considerable number of key communities and certain states in the principal anthracite-consuming territory. The questionnaires were mailed to anthracite producers and distributors on July 9. The results of the study were mailed in mimeographed form on September 19 and have been found of noteworthy value. In fact, the study has been called the most important recent achievement of the bureau, which the director modestly admits.

Not the least of the bureau's activities is the supplying of information to college students. A popular topic of school and college debating societies is the question of government ownership or control of the coal-mining industry. The bureau naturally leans to the negative side of the question and has been, it hopes, through the literature it supplies or references its suggests, helpful to the embryo orators opposing government ownership propaganda. Aid of this character has been extended to students as far away from the anthracite fields of Pennsylvania as Tucson, Jerome, and Scottsdale, Ariz.

In short, the purposes of the bureau are to assemble for the use and benefit of its subscribers such statistical and trade information as may be of interest to them, a weekly bulletin of from 8 to 12 mimeographed pages being the vehicle of conveyance, in addition to which by lectures, sometimes illustrated by lantern slides or moving pictures, before Kiwanis and Rotary clubs, or technical and non-technical societies, etc.; by the distribution of leaflets or other literature and by correspondence, usually in reply to inquiries, it endeavors to tell and to remind the public that for safety, cleanliness, comfort, general satisfaction, and, in the long run, economy, the ideal fuel for home heating is Pennsylvania anthracite. There are, of course, sections of the United States so far removed from the source of supply that cost of transportation takes it out of the economical class, but that is aside from the story.

## Anthracite—
## A Serviced Commodity

THE DEVELOPMENT AND EXTENSION OF SERVICE TO THE ANTHRACITE CONSUMER

A marked change in the attitude of the public toward the anthracite industry is being noticed in every section of the country reached by hard coal. Several years ago, the absence of any other fuel even remotely comparable with anthracite for domestic use led to a tendency to blame the coal for a large percentage of all heating complaints. This condition was further aggravated by the attitude of some, although fortunately not all, of the retail dealers, who in the absence of competition had grown apathetic toward their customers. Even those retailers who were willing to be of definite service to anthracite consumers found their attempts blocked by the difficulty of obtaining service men trained to the then unusual task of solving domestic heating plant difficulties.

Inspired by the results of an extensive survey, which showed that 98 percent of all complaints which retailers received were due either to the condition of the heating equipment or to its improper operation, the Anthracite Coal Service in 1926 entered upon the task of fortifying these retail dealers with sufficient sales and service information to enable them to extend worth-while service to their consumers.

Because of natural contacts between the individual customers and the dealers, it was considered desirable to reach the consumer by training representatives of the retailers rather than by attempting to reach them direct through a separate organization.

[1] "The Anthracite Bureau of Information." The Mining Congress Journal, November 9, 1925.

A textbook on domestic heating practices was first prepared by engineers of the service, designed to teach the elementary details of combustion, and in addition to give sufficient service information to furnish the clue to the solution of a vast majority of heating failures.

Training schools were established throughout the country, and the complete service course was offered gratis to as many representatives of the retailers as were in a position to attend the classes.

In addition to 12 lectures, comprising the technical training, this course includes a large number of actual visits to domestic consumers' heating plants by the dealers' representatives, accompanied by the service engineer. During these visits practical demonstrations are given of the points covered in the classes.

While this work is not by any means complete, definite progress has been made, and to date 1,729 employes and officers, representing 1,085 retail merchants in 69 cities, have completed the dealer service course and are thus better qualified than ever before to sell and service anthracite.

As a direct result of this training, a number of progressive dealers have added well-organized service departments, having as their object periodical calls upon each of their consumers, to assure continued satisfaction with hard coal. In all instances, service work has been reinforced by advertising designed to assure the consumer that his plant is always within the reach of a competent service man, and further, that this man is the logical person to make a coordinated investigation of all parts of the heating system.

The responsibility of the Anthracite Coal Service does not, however, end with the training of service men. New men are constantly being acquired by retailers, difficult situations and problems sometimes arise which are beyond the scope of elementary training, and large consumers often require the services of an experienced fuel engineer. For this purpose, a backbone of stations and substations has been established throughout the country, to come into continual direct contact with retailers and their service men and to assist them in the organization and furtherance of their service plans. These stations are at present located in the 22 important centers of New York, Philadelphia, Albany, Syracuse, Rochester, Buffalo, Toronto, Baltimore, Washington, Atlantic City, Harrisburg, Reading, Bethlehem, Chicago, Detroit, Milwaukee, Minneapolis, Boston, Hartford, Portland, New Haven, and Providence.

The experience of many retailers who have availed themselves of these service facilities convinced them that service is not only desirable and valuable in holding

*Retail merchant's window display featuring service*

*Retailers' representatives preparing a customer's system for heating season*

*Typical service automobile advertising anthracite as a serviced commodity*

the good will of the anthracite consumers but that it can be made an important auxiliary to both sales and advertising as well. In addition to correcting actual complaints, their men are in an excellent position to discover any advance signs of a contemplated change of fuel. As their training has fortified them with knowledge of the characteristics of competing fuels, they are in most cases able to prove that a substitution of one fuel for another will not correct faults in the heating systems.

In addition to the work of the Anthracite Coal Service and the retail merchant in furthering the use and confidence in hard coal, other parties interested in the industry have shown unprecedented action in standardizing anthracite as domestic fuel.

The operating companies have raised anthracite above the level of other fuels through the widespread use of modern machinery, both for separating the coal from impurities and for accurately segregating the various sizes to better accommodate every conceivable domestic requirement. The operators have conducted extensive advertising campaigns and have assisted a large number of retailers in conducting their local campaigns. They have taken an active interest in research work for developing new ways to use and burn anthracite, and have shown in every way that their interest in anthracite does not by any means cease when it has been sold to a retail merchant.

Even the feeling in the mining region toward the industry has undergone a complete change. Business organizations formerly indifferent toward the furtherance of anthracite markets now realize that the success of their communities depends to a large extent upon the prosperity of the industry. They are, therefore, making every effort to show that they are intensely interested in anthracite.

It is not surprising that coordinated efforts such as these have been reflected in such strong public sentiment as was recently expressed in a leading Philadelphia paper. In this editorial it was stated that an industry which had proven beyond a shadow of doubt that it was able to help itself, even under rather adverse conditions, surely deserved the help and support of the country at large.

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Under an appropriation by Congress of $1,000,000 for the exportation of coal in Government vessels, the Shipping Board has assigned six ships to this service, each with 8,727 tonnage. Two of the boats have been chartered. A third will be ready for service in January and three in February. The Coal Exporters Association of the United States, of which Arthur Hale is chairman, with headquarters in this city, is cooperating in promoting the export trade. Parties desiring to charter Shipping Board vessels for the Mediterranean should communicate with the Export Steamship Corporation, 25 Broadway, N. Y.

# COST *of* MAINTAINING EXCESS CAPACITY *in* BITUMINOUS COAL INDUSTRY*

*Coal Industry Going Through Very Dark Period —Economies That Are Expensive Being Practiced By Many Industries Formerly Furnishing Markets For Coal—Capacity For Further Extension Of These False Economies Limited— Future For Bituminous Beginning To Look Brighter*

*By* S. A. TAYLOR †

THE U. S. Geological Survey estimates the potential capacity of our coal mines at about 835,000,000 tons annually. If we take the actual production during the week ended December 4, 1926, which was 14,551,000 tons, we find, at the rate of production per week then obtained, we would have an annual production of over 750,000,000 tons, with quite a number of mines not operating, so that the figures of the U. S. Geological Survey are conservative.

Now let us look at the production of coal for the last decade in order, if possible, to see what is taking place in the coal industry.

| | Tons |
|---|---|
| 1918 | 579,385,820 |
| 1919 | 465,860,058 |
| 1920 | 568,666,683 |
| 1921 | 415,921,950 |
| 1922 | 422,268,099 |
| 1923 | 564,564,662 |
| 1924 | 483,686,538 |
| 1925 | 520,052,741 |
| 1926 | 578,290,000 |
| 1927 | 519,804,000 |

From these figures it is at once apparent that during this decade there was no increase in the amount of coal produced in the United States.

The production of bituminous coal from 1850 to 1910 is as follows:

| | Tons |
|---|---|
| 1850 | 2,880,017 |
| 1960 | 6,494,200 |
| 1870 | 17,371,305 |
| 1880 | 42,831,758 |
| 1890 | 111,302,322 |
| 1900 | 212,316,111 |
| 1910 | 417,111,142 |

From the above table it will be seen that the production of bituminous coal approximately doubled every 10 years and we very naturally ask the question why it is that in the past decade there has been no increase in the production of bituminous coal, especially so, when we consider that the horsepower per capita used in the United States is practically the same as it has been for a number of years?

This query brings us face to face with the real condition that has brought the coal industry into the present grave situation. The study of the problem gives us a little insight into what we may expect in the near future, as to the probable consumption of coal, and thus determine, approximately, the time when this excess productive capacity of the mines may be taken up, and result in an equilibrium in the coal industry.

The high price of coal during and after the World War, when labor and supply costs were high, caused many of the large users of coal to effect savings in their coal bills. This was accomplished to some extent by securing greater efficiency in burning of coal, also in the use of substitutes.

For the past score of years the passing of smoke ordinances in the larger centers of population has caused investigations as to how coal could be burned preventing smoke and the contingent losses. This resulted in the construction of large electric power plants, with a tremendous expenditure of capital, to generate electrical energy to take the place of plants using coal in ordinary boiler plants. This resulted in a great reduction of coal consumed, through more efficient use, in the generation of power over the old methods, at the same time displacing a great deal of power, which was formerly produced in the small plant by the burning of coal, by the substitution of electrical energy for the power produced in the small plants. This, while probably not much cheaper as to cost to the consumer, did away with a nuisance in the way of smoke and resulted in a much reduced amount of coal consumed over the old method of producing the same amount of power. This may be brought more forcibly to your minds if stated in another way. The amount of coal necessary to produce a K. W. hour of power or its equivalent was, under the old conditions, close to 4½ pounds, while in the large central power plants a K. W. hour is produced with about 1½ pounds of coal. Indeed, in some of them at 1 pound and better. By multiplying the K. W. hours now being generated in central power plants by 3 pounds, the savings in coal will amount to about 125,000,000 tons this year, if the production the first half of this year is maintained during the last half of this year, and in 1925 it amounted to 100,000,000 tons of coal saved.

Again the old way of making coke in bee-hive ovens resulted in a great loss of heat, and all of the by-products.

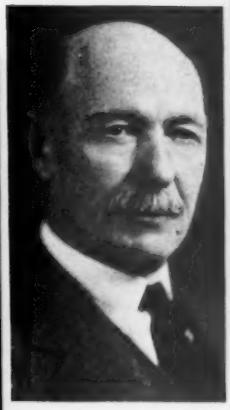
The question of economy and eliminating the smoke nuisance in producing coke led to general use of by-product coke plants, until they are now the rule instead of the exception of a few years ago, considering only the displacement of coal by two of the by-products of this method of making coke.

In 1925 the yield of gas available for use in lieu of (*Continued on page* 895)

* An extract from an address delivered at 11th Annual Meeting of The National Coal Association, Cleveland, Ohio.

† Pittsburgh, Pa.

*J. B. Pauley, Vice Pres.*



*P. J. Quealy, Vice Pres.*

*E. C. Mahan, President*

*Chas. E. Bockus, Treas.*

*F. S. Love, Chairman Publicity Committee*

*W. H. Cunningham, Vice Pres.*

# *The* WORK *of the* NATIONAL COAL ASSOCIATION

*By* C. B. HUNTRESS *

*Harry L. Gandy Executive Secy.*

***A REVIEW Of The Work Of The Association, Which Embraces Research, Safety, Taxation, Trade Information, Traffic, Government Relations, Marketing, Trade Practice And Public Relations.***

IN THE stress of the war days, organization of bituminous coal operators on a national basis was effected through the formation of the National Coal Association. Groups of operators in several producing fields had for some years previous worked through district bodies, but this was really the first attempt at organization of producers in the far-flung fields into a central body with a national policy. Launched with the immediate objective of cooperation with the Fuel Administration, the association rapidly developed a broader program. It didn't take the leaders of the industry long to discover that there was a vast number of problems of more or less vital concern to the entire industry which could be properly approached and adequately handled only through the medium of collective effort on a national scale.

The consequence was that the organization, called into being primarily to cope with the exigencies of a war period, continued at full steam ahead when the country readjusted itself to a normal schedule. The potential possibilities of organized effort were quickly sensed by the leaders of the industry, with the result that the scope of activities of the association has been steadily enlarged. An excellent picture of the associational service now rendered is given in the proceedings of the eleventh annual meeting, held in Cleveland, Ohio, last month, copy of which will be furnished by the National on request. Such a brief review as this affords opportunity to sketch only a general outline of the history and program of the organization.

W. K. Field was chosen the first president of the association in 1917. It was not until the following year, however, that the National was incorporated, and in that year the late J. K. Wheelwright, then president of the Consolidation Coal Company, was named to succeed Mr. Field as president of the association. The first executive secretary of the National was John D. A. Morrow, who later succeeded Mr. Field in the presidency of the Pittsburgh Coal Company. In 1923 Harry L. Gandy succeeded Mr. Morrow as executive officer of the National.

Anent the ambitious claims of some organizations with respect to the measure of service to their respective industries, one is reminded of an incident which took place here in Washington, where the headquarters of the National are located, when "Uncle Joe" Cannon was at his picturesque best.

A certain pious lobbyist was expatiating to a group in a committee room.

"No," he reiterated, "I never drink, smoke, chew tobacco, use profanity, or——"

"Gosh," interupted one of the group, "I wish I could say that."

"Why can't you?" snapped Uncle Joe, "he said it."

The fact of the matter is that, unless the question is closely tied to dollars and

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cents, there is no real reason why an association which does render constructive service should hesitate to make rather extensive claims regarding the merits of its program. By reason of the very nature of the work it is impossible to reduce to dollars the exact value of a service program to the membership of an industrial group. There are many cases of service to individuals, relating to taxation and other subjects, where the monetary value of associational service can be more or less definitely fixed, but the far-reaching worth of many forward-looking programs can not, of course, be accurately calculated. This statement applies both to activities which are classified as of a defensive character, such as opposition to pernicious legislative proposals and to constructive measures having to do with research, safety and marketing.

The membership of the National is composed both of members of what are known as local or district associations of operators and of individual members; that is, operators in a territory where there is not a local association of operators. The commercial tonnage of the Nation is well represented on the membership roll and there is also a sizable representation of consumer-owned production. The work of the organization is carried on largely through committees, of which more than 100 operators are members. As has been indicated, it is impossible to crowd into 2,000 words a record of activities commencing with the stormy days of 1917. The only feasible alternative is to touch upon some of the more recent projects of major committees.

### Research

In the direction of research the purpose has largely been to coordinate research activities throughout the country, and to keep the industry advised of outstanding developments of a practical slant. The committee issued a number of publications recently, including a report on developments in powdered coal and a comprehensive statement of research activities in bituminous coal the world over. A study is being carried on with representatives of 17 other organizations to develop a program that may be advantageously promoted by the 18 organizations, interested from different standpoints in bituminous research. The National for several years has financed a research fellowship at Carnegie Institute of Technology and is represented on an Advisory Committee of the Massachusetts Institute of Technology. Numerous speakers are furnished from the ranks of the membership for the programs of engineering and research societies. A close cooperation is maintained with the American Standards Association, formerly the American Engineering Standards Committee, whose principal aims, so far as the coal-mining industry is concerned, are the preparation of standard codes of practice in mine operations and a study of coal classification.

### Safety

The association works with the Coal Mining Section of the National Safety Council and is a member of the Joseph A. Holmes Safety Association. Trophies are donated to winners of first aid and mine rescue meets, and reports, both of a general and scientific nature, treating of safety records and problems, are furnished to the industry and the public. Addresses by officers and members of the staff of the association have been made before many organizations.

### Taxation

The Committee on Taxation deals with all phases of taxation that have any bearing on the business affairs of members of the bituminous industry. To assist the committee in this work the services of a tax expert are employed. During the last year representatives of the association have made several appearances before committees of the House and the Senate on matters relating to the modification of the 1926 Revenue Act, and have conferred with members of the Congressional Joint Committee on Taxation relating to various tax simplification proposals. The committee is taking a lively interest in decisions of the Board of Tax Appeals on cases dealing with allowable deductions and has engineered conferences of counsel of various companies which have cases pending before the Board of Tax Appeals involving the deductibility of expenditures for mine equipment purchased to maintain production. The program is complemented by publication of a digest which carries all important decisions by the courts, the Board of Tax Appeals, and the Treasury Department.

### Trade Information

The National compiles weekly summaries of reports which it receives from local associations and issues weekly estimates of production four days in advance of the figures published by the U. S. Bureau of Mines. It also compiles and issues monthly tables showing the amount and the cost of the coal used by the railroads in transportation train service and a semi-monthly statement of receipts, shipments and stocks of coal at the head of the Lakes.

### Traffic

A traffic department is maintained to keep the membership advised on important traffic matters, including decisions of the Interstate Commerce Commission and decisions of the Federal courts which relate to traffic or transportation.

### Government Relations

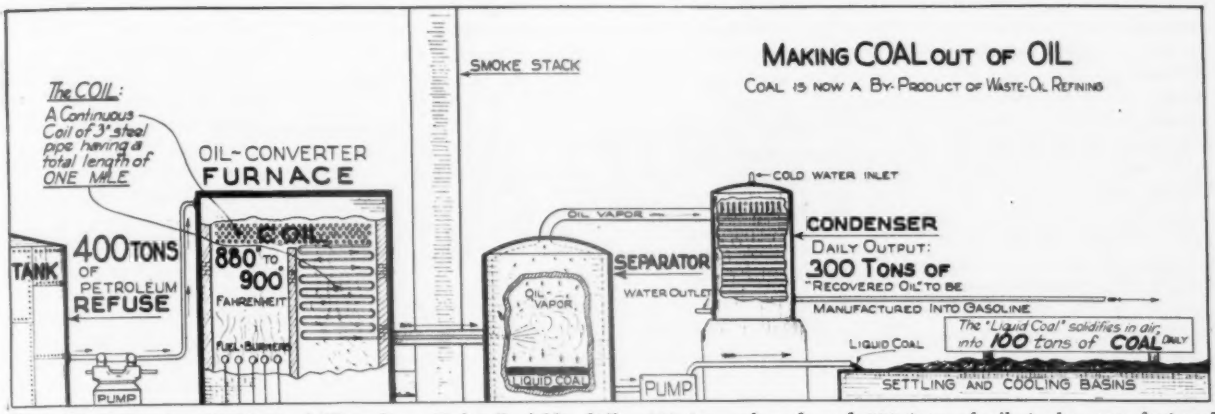
Because of the predeliction of Federal legislators to search into the affairs of the industry, as reflected by the numerous investigations by commissions and hearings by committees of the Congress during the last decade, no small measure of effort and time has been devoted to a presentation of facts and figures in answer to unfounded charges on which were based legislative proposals for regulation whose enactment would have hog-tied the industry. In the first session of the Seventieth Congress scores of bills were introduced affecting the industry, one of which is likely to be pressed during the second session, which opened this month. Reference is made to a bill ticketed as S. 4490, introduced in the Senate by the chairman of the Interstate Commerce Committee at the instance of the Mine Workers' Union and following 10 weeks of hearings on conditions in the West Virginia, Ohio, and Pennsylvania mining fields. According to eminent counsel, the effect of the enactment of this particular measure would be the domination of the industry by the union. Consequently, the vital importance of this line of effort on the part of the nation-wide organization of bituminous producers can be readily understood.

### Marketing

Whereas the organization during its infancy was largely concerned with matters which had to do with production, there has been a gradual development of interest in distribution, and so it may be said that the organization is today sales-minded as well as production-minded. The range of the program of the Marketing Committee is somewhat extensive, having to do with sales practices, advertising, foreign trade, educational work, and commercial research in its broad ramifications. The committee has established a close contact with the National Association of Purchasing Agents, which has made for a mutual understanding of each other's problems on the part of the buyers and sellers of bituminous coal. Development of interchange of credit information on the part of local operators' associations is encouraged by the National, and the organization of a credit bureau on a national scale is one of the divers projects which the committee has under consideration.

### The Trade Practice Movement

As a remedy for ills with which the bituminous coal industry is afflicted, ills common to numerous other lines of trade and business, and which might be generally attributed to excess capacity, the trade practice (*Continued on page* 895)


MAKING COAL OUT OF OIL
COAL IS NOW A BY-PRODUCT OF WASTE-OIL REFINING
SMOKE STACK
The COIL:
A Continuous Coil of 3" steel pipe having a total length of ONE MILE
OIL-CONVERTER FURNACE
400 TONS OF PETROLEUM REFUSE
TANK
880° TO 900° FAHRENHEIT
FUEL-BURNERS
PUMP
OIL VAPOR
SEPARATOR
WATER OUTLET
LIQUID COAL
COLD WATER INLET
CONDENSER
DAILY OUTPUT:
300 TONS OF "RECOVERED OIL" TO BE MANUFACTURED INTO GASOLINE
The "Liquid Coal" solidifies in air, into 100 tons of COAL DAILY
SETTLING AND COOLING BASINS

*With this apparatus 400 tons of "Petroleum Refuse" yields, daily, 100 tons of coal, and 300 tons of oil, to be manufactured into gasoline*

# MANUFACTURING BITUMINOUS COAL *from* PETROLEUM

*By* DR. WALTER F. RITTMAN *

***MANUFACTURED Bituminous Coal Is Resultant By-Product From Refining Crude Petroleum—Plant Now Producing Thirty Tons Per Day And Is To Be Enlarged—Operation Is Commercially Profitable—Possibility Of Using Coal In This Process***

WHILE the making of coal from petroleum is only incidental to the process I am about to describe, and is in no sense to be taken at this time as a possible demoralizer of coal markets; on the contrary, this development may point the way to opening new channels of outlet for restricted coal production.

I believe this manufactured coal may prove to be an ideal starting material or raw product, either alone or mixed with other coals, for the processes of converting coal into petroleum. As matters now stand, one important American oil refinery is planning to provide facilities to convert its crude petroleum into gasoline with the manufacture of some coal as a by-product; with the combination of processes I have indicated above it would by no means be difficult to visualize a plant capable of converting the crude petroleum entirely into gasoline.

The first question which naturally arises is: "Is it commercial?" For a period of months the plant in question has been manufacturing some 50 tons a day of the material; facilities are now being provided to increase this to 100 tons a day, with plans under way to considerably increase that output; the balance sheet is decidedly in the black, but these statements do not answer why it is commercial. To answer these questions it becomes necessary to briefly describe conditions, more particularly those existing in the United States Midcontinent section, pertaining to gasoline production and fuel-oil markets. Despite the predictions, widely published, made some five years ago by a prominent committee to the effect that America's oil supply would be exhausted in some six years, the American petroleum industry is today facing a serious menace in a potential avalanche of "shut-in" crude petroleum. To the credit of the industry, it is becoming the practice of oil refiners to handle only such quantities of crude oil as can be refined efficiently and profitably. Whereas, not many years ago the average production of gasoline from crude oil was well below 20 percent, it is by no means unusual today to find refineries converting 75 to 80 percent of their crude oil into gasoline. This is achieved by what are known as "cracking" processes. The "skimming plant," which merely distilled off the gasoline from the crude oil and sells the balance as fuel oil, no longer can compete with the more complete refinery.

Low-grade fuel oil at the present time, in the Middle West, is selling for about 1½ cents a gallon, and during the past six months quantities have been sold for as low as 62/100 cent a gallon. When, with a manufacturing cost of a few cents a gallon, it is possible to convert considerable portions of this fuel oil into gasoline, it at once becomes obvious that the goal of the progressive refiner is to produce a maximum of gasoline and a minimum of fuel oil from a given quantity of crude oil, particularly since he receives for a gallon of fuel oil only a fraction of what he pays for crude petroleum. Moreover, other conditions prevailing and developing in the Midcontinent point strongly to a depressed fuel-oil market. Coal is cheap. Despite the cheapness of coal, however, another factor looms big over the horizon. I refer to the long-distance piping of natural gas. Within the next year literally hundreds of millions of cubic feet of natural gas originating in Texas, Montana, and other states will daily be delivered to the great fuel-consuming centers of the Middle West. Pipe lines for months have been delivering natural gas, originating in Texas, to Denver, together with the cities en route. Pipe lines are now being laid to connect Texas and Kansas City, supplying cities en route; with discussed plans to continue the lines to Chicago; a project financed by another to pipe natural gas from Texas to Omaha, Nebr., and other cities en route, is about to

* Carnegie Institute of Technology.

be consummated; announcement has been made of a project to pipe gas from Montana to Utah and California. It appears now that in relatively few years a large portion of the Middle West will have available natural gas at prices low enough to offer serious competition to coal, and ruinous to the petroleum refiner having large quantities of fuel oil to sell. In short, the problem of the Middle West petroleum refiner is, and very probably will continue to be, "Make more gasoline and less fuel oil from a given quantity of crude oil," and it is as a by-product of this situation that the manufacture of coal from petroleum refuse is made commercial. The quantity of gasoline required appears to be of constantly increasing proportions. With almost 30,000,000 automobiles, the United States in 1929 will produce well in excess of 15,000,000,000 gallons of gasoline, with an annual increase of, roughly, 10 percent.

As a by-product of the cracking process at the plant to which I will now refer, there is produced a refuse oil, fuel oil, considerably heavier than water and containing considerable solid matter. In this particular cracking process lime is used in the process, and this lime concentrates in the refuse and constitutes a part of the solids referred to above, the balance being free carbon. The problem was to recover the oil present in this refuse at a minimum cost in order to make more gasoline from the recovered oil. A common practice is to charge this refuse to shell stills, called "coking stills" in the art, put a fire under the still and continue heating until only coke, with very low volatile matter content, remains. This "batch" procedure requires a big investment in stills; depreciation and maintenance is high, and the coke must be removed manually with a variety of implements. The cost of recovering the oil is real, both with respect to investment as well as labor and maintenance. In the present operation the refuse oil is pumped through a long continuous coil (about 3 in. inside diameter and several thousands of feet long) placed in a furnace, known in the art as a "pipe still." The end of this heating coil leads to a chamber, from the top of which the vaporized oil is led to a condenser and recovered, and the "bottoms," while very hot and still in fluid condition, are pumped to any desired point, and, in fact, can be pumped directly into the car in which shipment is to be made. By controlling the rate of flow through the coil, as well as the furnace temperature, neither of which are difficult, one can readily control the percentage of volatile matter left in the residue. This percentage of volatile matter left in the residue naturally will be primarily influenced by distillate markets and operating conditions. An analysis of a typical residue which congeals into an amorphous bituminous coal follows:

| | |
|---|---|
| Volatile matter | 45% |
| Fixed carbon | 51% |
| Ash (lime) | 4% |

The operation appears to be practically continuous, in that runs of two to three weeks' duration have been common. With manual labor of practically negligible proportions, since no manhandling is involved; with low investment cost as compared with coke stills; and with relatively low maintenance cost, it becomes apparent why the operation is commercial. One could almost afford to give away the coal. However, this is by no means necessary. Large-scale tests are under way and it already appears that this coal is most desirable for "coking" purposes to produce metallurgical coke. The reasons for this are apparent when one considers the character and low percentage of ash, together with the fact that the coal is low in sulphur.

In addition, large-scale experiments are under way wherein the material is being pulverized before burning; also a large boiler is being equipped with a type of rotary burner used in oil refineries. Also, as previously stated, I feel that this material might be an admirable raw product for the processes which propose to convert bituminous coal into petroleum, which petroleum in turn could, by present methods, be converted entirely into gasoline with small quantities of more coal, thereby creating a cycle and bringing to reality the desire of progressive petroleum technologists; i. e., to convert crude petroleum entirely into gasoline.

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**EDITOR'S NOTE.—Dr. Rittman brings a real message from the Petroleum Industry—a scientific paradox, a contemporary perspective in fuel evolution.**

**There is need for a broader outlook in coal. Does the industry not need a consciousness of coming general tendencies in fuel marketing rather than further ideas of present agonies? Will not detailed knowledge of present competition shortly be of little value?**

**Is there not a vital danger of the coal mine awakening to radical advances, controlled by a limited, related few—with markets further restricted, more intense, more ravaging?**

**Will coal producers unite for technological marketing study? What agency will lead this offensive?**

## BULK OF ASPHALT COMES FROM PETROLEUM

The principal source of the asphalt so largely used in the construction of the Nation's highways is by many thought to be the famous pitch-lakes of Trinidad, but the fact is that asphalt derived as a product in the refining of petroleum far outranks other asphalts in importance, according to the U. S. Bureau of Mines. The total value of the yearly sales of petroleum asphalts is nearly ten times that of native asphalts and related bitumens.

Very little petroleum asphalt was manufactured before the twentieth century, as the asphaltic materials that were obtained as residuals by refining were of inferior quality. With the rise in production of asphaltic base petroleum in California during the early part of the twentieth century, the discovery of the beneficial results obtained by the use of steam in refining, and the growth of asphalt in public favor as a road-building material, the petroleum asphalt industry was placed on a firm basis and grew rapidly. A further impetus was supplied when Mexican petroleum, which has a high asphalt content, was imported in quantity for the first time.

The term "asphalt" is commonly used to denote the various forms of bitumen found in nature or produced by refining. The term includes: Native asphalt, which in the United States is generally associated with other mineral matter, such as limestone and sandstone, and is usually called bituminous rock; the "related bitumens"—a series of natural hydrocarbons, of which only gilsonite, grahamite, ozokerite, and wurtzilite (elaterite) are of commercial importance; and petroleum asphalt, the major class, obtained in the refining of oils of an asphalt base or a mixed asphaltic and paraffin base. Native asphalt of the "pitch lake" type is not found in the United States in sufficient quantities to compete with the celebrated Trinidad and Bermudez Lake deposits, which together supply nearly all of the asphalt imports of this country.

The term "bituminous rock" is used to designate all kinds of rock, whether in a friable or solid state, that contain an appreciable quantity of bitumen or asphalt intermingled in the stony particles. Bituminous rock therefore includes asphaltic earth, sand, sandstone, shale, and limestone, of which asphaltic sandstones and limestones are the most important.

Detailed information in regard to the asphalt industry of the country is given in the Bureau of Mines' publication, "Asphalt and Related Bitumens in 1927," by G. R. Hopkins and A. B. Coons, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 5 cents.

**COST OF MAINTAINING EXCESS CAPACITY**
(*From page 890*)

coal was equal to 35,000,000 tons. It will probably now approximate 40,000,000 tons of coal displaced.

The coal tars used by the steel companies in lieu of coal in 1925 was approximately equivalent to 15,000,000 tons of coal, and is now considerably more than that amount.

Another substitution for coal was by the use of crude oil for heating. In 1925 this item also accounted for the displacement of 200,000,000 tons of coal allowing 3½ barrels of oil equal to 1 ton of coal, and now practically all steamship lines and many of the railroads are using fuel oil, as well also a large amount being used in the heating of buildings, it is safe to assume that oil substitution for coal has not been reduced very much, if any, at the present time.

Again the economies that railroads made in the use of coal as fuel resulted in close to 65,000,000 tons less in 1925 than it would have been had the methods of using coal in 1910 been continued. The larger tonnage moved by the railroads since 1925 and the economies that have been inaugurated since that time would probably account for a saving of coal of close to 70,000,000 tons this year over that used in 1910, for the present tonnage hauled.

A summary of these savings and substitutes will give the following for 1925, exclusive of the increase in water power and natural gas:

| | Tons |
|---|---|
| Power plant | 100,000,000 |
| By-products coke gas | 35,000,000 |
| By-products coke tar | 15,000,000 |
| Oil substitutes | 200,000,000 |
| Railroad economy | 65,000,000 |
| | 415,000,000 |

This figure is approximately correct, and if this amount is added to the production for 1925 or later, the entire mine capacity would have been required to produce the coal that would then have been needed and the same is true today. The Department of Commerce yearbook for 1928 at page 265, etc., shows that there were even more economies than those here enumerated and shows also that the figures above check quite closely to the power requirements for today.

The above tonnages used are not to be taken as exact, but are approximate to show that had not these great and unusual economies and substitutions taken place the coal business would not be in its present deplorable condition.

This is a dark picture and, while there are some new substitutes appearing on the horizon, the old saying, "The darkest hour of the night is just before the dawn," I believe is applicable to the coal industry, for the economy stage has about run its course, without such an outlay of capital as will not be justified, and this gives us a ray of hope for improvement in the demand for more coal in the near future.

If we look over the country we find that most of the territory where it will be profitable to build large central power plants is now occupied and it does not seem possible for anything like the extension of this field in the near future as has taken place in the last 15 years.

Again, most of the large steel plants are now provided with by-product coke plants and outside of plants in large centers of population, where coke and gas may be substituted for domestic coal, this competition does not look as formidable as in the past.

In the matter of oil this does not give us much comfort for some time to come, as the output of cheap oil has increased during the last two years enormously and consequently, for some few years at least, we must expect to see oil continue as a substitute for coal in large amounts.

In the matter of railroad economies, the menace does not seem so great. It has been stated, and probably correctly, that for the railroads to effect any very great additional economies will require a great outlay of capital for changes in motive power.

A newspaper report recently quoted one of our great industrial leaders as stating that the coal industry was now suffering from some economies which were not true economy, and went on to say that some of the larger users of coal were burning dollars instead of coal and that where economies were secured at a cost of capital which would not return more than 5 percent on the capital invested to secure the same, was false economy, and that this had been done recently by some larger users of coal.

Now if these figures are true or nearly true, and I believe they are, we can expect that the next few years will see this great basic industry coming back into its old stride.

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**NATIONAL COAL ASSOCIATION**
(*From page 892*)

movement is now receiving the attention of a special committee of the association, and there is widespread interest on the part of local associations in the proposal to abolish what are known as unfair trade practices. Investigation has determined the fact that the demoralization in the marketing of bituminous coal can be accounted for in large measure by the practice, on the part of certain individual operators, of methods of seeking business which are most harmful to the industry as a whole. Request to the Federal Trade Commission to call a conference of the industry at which a statement of unfair practices might be formulated has been advanced as the logical procedure and will receive the attention of the special committee which has the matter in hand. This is in line with the effort of industry the country over to eliminate unfair practices by self-regulation, rather than by governmental control, and the outlook for a successful issue appears very promising.

### Public Relations

Addresses are made before organizations of other industries and civic bodies in order to enlighten other lines of business and the general public on the problems of the industry. This speaking program is reinforced by magazine and newspaper articles which deal with human-interest angles relating to the mining and sale of bituminous coal. Pamphlets, giving basic facts in vivid terms, for which the copy was prepared by the National, have been distributed by railroads on dining cars and through the mail, notably by the Louisville & Nashville Railroad, and voluminous data are supplied to newspaper editors for general information about the industry.

### Publications

Besides the digests of tax cases and reports on matters bearing on traffic, transportation and trade information, to which reference has been made, the National issues a bulletin to its members, carrying the spot news of the industry and reporting activities of the organization.

In conclusion, it is worth while to note that, in the face of the depression which the bituminous industry has felt during recent years, there has been a steady increase in the membership of the National Coal Association. This increase reflects a recognition on the part of the industry of the value of the services of the National.

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Governor Parks, of Alaska, in his annual report states that 62 percent of the mineral production of Alaska since 1880 has been from gold mines. The placer mines have yielded more than the lodes. The 1927 production was valued at $14,404,000 as compared with $17,664,800 in 1926. Decline in production is attributed to the exhaustion of the known high-grade placer ground and the lower selling price of the mineral products. He says the production of gold by dredges will increase and that the low point has been reached in the mineral output. Production of gold decreased from $6,707,000 in 1926, to $5,927,000 in 1927, while the value of copper mined decreased from $9,489,000 to $7,250,000. As gold derived from lodes increased over 1926, he says the decline in gold production is due to the reduced output from placer mines.

# *The* CRACKING *of* OIL *from* SHALE

*By* GUSTAV EGLOFF †

THE commercial cracking of heavy oils into gasolene, is of comparatively recent development. Yet there are few refiners of crude oil at the present time who can operate economically without the cracking process as part of their equipment. The automobile industry could scarcely have developed to its present size were it not for the supply of gasolene made available by cracking, as otherwise the price of motor fuel would be distinctly higher than it now is.

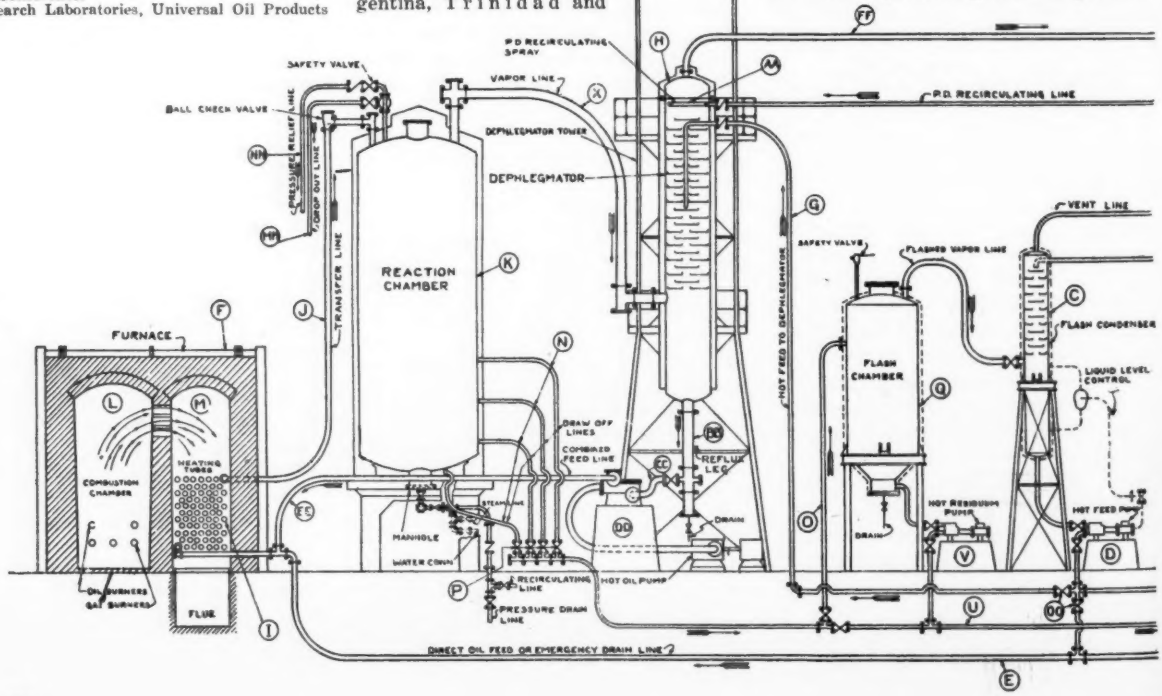
Vast amounts of money have been expended in research on cracking in working out the commercial conversion of fuel oils into gasolene. It is estimated that over $40,000,000 has been spent in endeavours to develop commercial cracking processes.

The improvement which has been made in cracking units in their evolution during the last two decades or so, has been startling. The early shell cracking stills, some of which are still in use, had a daily capacity of approximately 125 barrels each. They were limited to the use of a selected gas oil charging stock, and their yield of gasolene was about 30 percent. The modern cracking process employs units having a capacity of 750 to over 2,500 barrels per day, converting any type oil, kerosene distilate, gas oil, fuel oil, topped crude, or crude oil—into gasolene with yields of 50 to over 75 percent. Despite the somewhat greater complexity of the modern pressure still, its high efficiency makes the first cost, per barrel of gasolene produced per day, only one-fourth of that of the early cracking units. Had it not been for the great advance in the process of cracking, the investment necessary to produce the present volume of cracked gasolene would be over $1,000,000,000, instead of the $275,000,000 which is the approximate value of the world's present cracking equipment and its auxiliaries, such as storage tanks, agitators, rerun stills, boiler houses, land, etc.

The use of the cracking process is world wide. Commercial plants are now in operation or under construction in such widely separated countries as Japan, Borneo, Java, the Dutch West Indies, Australia, Roumania, India, Great Britain, Belgium, Italy, Argentina, Trinidad and Canada, as well as in all the refining areas of the United States.

The cracking process is the most effective force in oil conservation. Owing to the fact that one-third of our gasolene is made by cracking instead of by the simple distillation of crude oil, it is necessary to produce far less petroleum than would be required were the cracking process not in use. During the year 1927, 450,000,000 barrels of crude oil were conserved by the cracking process which produced 4,500,000,000 gallons of gasolene from oils which contained no gasolene as such. Without the agency of the cracking process the oil fields of the world would have been called upon for 1,700,000,000 barrels of oil during the year 1927, instead of the 1,255,000,000 actually produced, which was sufficient (in fact more than sufficient) to supply the requirements of the world's 29,500,000 automotive vehicles. During the last 15 years the saving in crude oil due to the cracking process is conservatively estimated at over 1,750,000,000 barrels.

The primary use of the cracking process up to the present time has been the conversion of petroleum oils into motor fuel. But tremendous as are the achievements along this line, they come far from representing the full possibili-




* From an address delivered at the World Power Conference.

† Research Laboratories, Universal Oil Products Co.

ties of cracking. The cracking process can convert any liquid carbonaceous material into practically any hydrocarbon product. From petroleum, besides the main product gasolene, kerosene, furnace or Diesel oil, residual fuel oil, coke, and gas are obtained. As secondary products, paint thinners, solvent oils, lubricating oils, and asphalts may be prepared. Chemically, the products of cracking include hydrocarbons of all the series—paraffins, naphthenes, olefines, diolefines, acetylenes and aromatics. By this production of hydrocarbons of the most varied sorts the cracking process opens the door to the but partially explored field of the chemical by-products of petroleum. Alcohols, fatty acids, resins, dyes, pharmaceuticals, and explosives, are some of the products that may eventually be made from petroleum through the agency of the cracking process.

But the modern cracking process is not limited to petroleum oils alone. Its flexibility is such that it produces high yields of gasolene from any oil, whether it be petroleum, low temperature coal tar, shale oil, bitumen, wood tar, vegetable oil, fish oil, or peat oil. The cracking of oil from shale will be in the future particularly important because of the wide distribution of shale deposits through the world and their immense extent.

## *Shale resources---Operation of cracking process---Domestic and foreign resources discussed*

### Oil Shale Resources

The total quantity of oil shale in the world is unknown. That it is huge is generally acknowledged. The world's potential shale oil production is estimated to be at least 300,000,000,000 barrels. By the use of the cracking process this oil would yield sufficient gasolene to operate all the motor cars in the world at the present time, for over 400 years. The cracking of shale oil into gasolene will be the dominating feature making profitable the utilization of oil shale.

The by-products from cracking shale oil are gas and coke. The world's potential volume of shale oil would yield 180,000,000,000,000 cu. ft. of fuel gas and 11,250,000,000 tons of coke.

Oil shale deposits are located in many parts of the world, the principal deposits on the American Continent being those of the United States, Canada, Brazil, Argentina and Chile. In Europe they are found in the British Isles, France, Jugo-Slavia, Spain, Sweden, Bulgaria, Germany, Italy, Switzerland, Esthonia and Russia. There are also considerable amounts of oil shales in Australia, China, Japan, Arabia and Syria.

The oil shale resources of the United States were estimated by the American Petroleum Institute to be 394,343,819,000 tons, which would yield 108,424,801,000 barrels of oil. The richest deposits occur in the Green River formation of the Rocky Mountain region, large beds being found in Colorado, Utah and Wyoming, while there are also deposits of importance in Montana, California, Indiana, Kentucky, Nevada and other states. The estimated amounts of oil shale and potential shale oil in the states having the largest deposits are as follows:

| | Oil Shale (in thousands of short tons) | Shale Oil* (in thousands of barrels; 42 gal.) |
|---|---|---|
| Colorado | 113,792,000 | 40,640,000 |
| Utah | 92,159,000 | 16,588,620 |
| Kentucky | 90,604,800 | 28,993,536 |
| Indiana | 69,696,000 | 13,939,200 |
| California | 13,939,200 | 5,575,680 |
| Wyoming | 7,176,000 | 1,291,680 |
| Montana | 6,969,600 | 1,393,920 |
| Nevada | 7,219 | 2,165 |
| Totals | 394,343,819 | 108,424,801 |

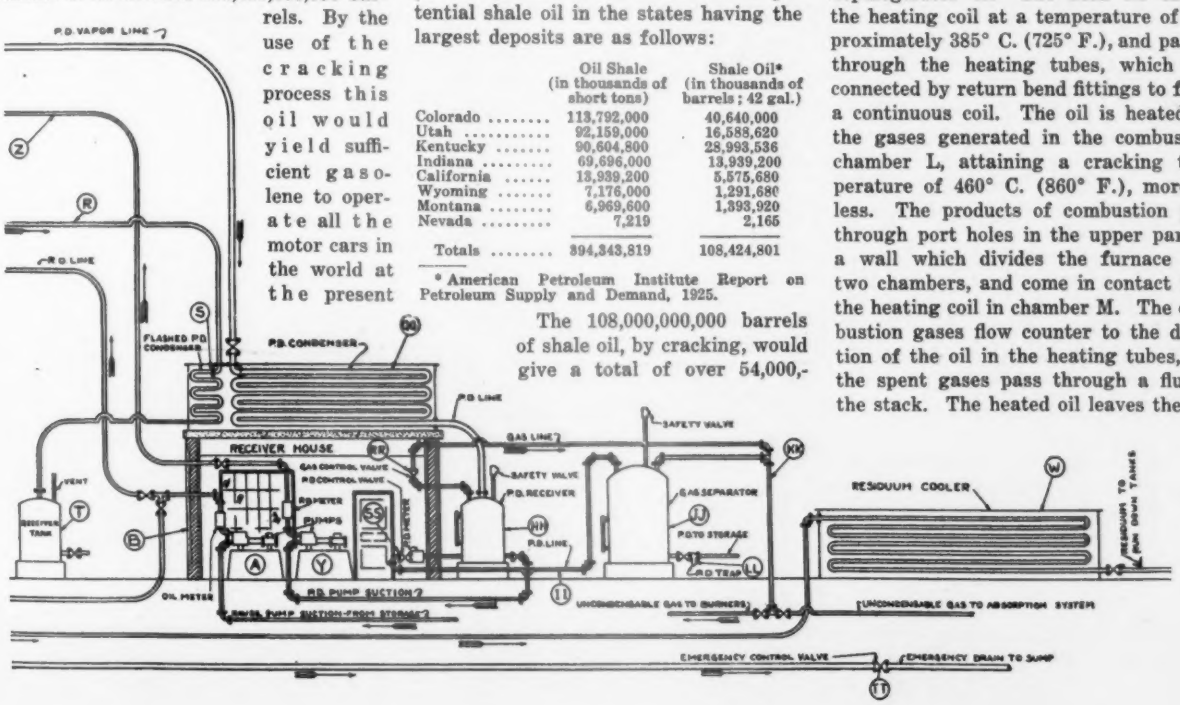
* American Petroleum Institute Report on Petroleum Supply and Demand, 1925.

The 108,000,000,000 barrels of shale oil, by cracking, would give a total of over 54,000,000,000 barrels of gasolene, which would supply the 24,000,000 automobiles now in operation in the United States for over 150 years.

### Operation of the Cracking Process

The operation of the cracking process will best be understood by a description following the flow chart of a typical installation.

The oil to be cracked is pumped to the plant at a uniform rate by pump A, the suction side of which is connected to the oil storage tank. The raw charging stock may be pumped into the flash condenser C, to the dephlegmator H, or directly to the heating tubes I. All the charging stock may be pumped to any one of these elements of the cracking system, or it may be split as the operating conditions warrant. The charging stock pumped into the flash condenser C comes into intimate contact with the vapors from the flash chamber Q, so that the temperature of the charging oil is raised by condensing a portion of the vapors. The charging stock and condensed vapors are drawn from the bottom of the flash condenser C by the hot oil pump D and discharged into the dephlegmator H by means of the pipe connection G. The preheated charging stock comes into contact with the hot vapors in the dephlegmator and is thereby raised to a substantially higher temperature. As an alternative, part or all of the charging stock and condensed vapors from the flash condenser may go directly through the feed line E to the heating tubes I. The valves 00 control the proportion of the split feed which passes to the heating coil I or to the dephlegmator H. The feed oil enters the heating coil at a temperature of approximately 385° C. (725° F.), and passes through the heating tubes, which are connected by return bend fittings to form a continuous coil. The oil is heated by the gases generated in the combustion chamber L, attaining a cracking temperature of 460° C. (860° F.), more or less. The products of combustion pass through port holes in the upper part of a wall which divides the furnace into two chambers, and come in contact with the heating coil in chamber M. The combustion gases flow counter to the direction of the oil in the heating tubes, and the spent gases pass through a flue to the stack. The heated oil leaves the last



tube of the coil and discharges from the transfer line J, into the reaction chamber K. The reaction chamber is not fired or heated externally and is thoroughly insulated against heat losses.

The residual oil is withdrawn from the lower portion of the reaction chamber K through the draw-off pipe connections N by means of control valves P. It then passes through line O into the flash chamber Q, which is maintained under a pressure lower than that of the reaction chamber K. Here the lighter portions are flashed off as vapors, leaving a heavy residuum to be drawn off from the bottom of the flash chamber. The vapors pass from the chamber Q to the flash condenser C, where they are brought into contact with fresh charging stock to which they give up a portion of their heat, and where they in part undergo condensation. The uncondensed vapors pass through the line R to the cooling coil S and are collected in the receiver T. The hot residual oil from chamber Q may pass through the cooling coil W to a storage tank, or it may be burned in the combustion chamber L while still in a heated condition.

The cracked vapors leave the top of the reaction chamber K through the vapor line X, which is connected to the dephlegmator H, where they mingle with the in-going preheated cracking stock.

The temperature of the vapors leaving the dephlegmator H is maintained at any point desired by cooling with pressure distillate oil. This cooling is accomplished by means of a pump Y, which discharges a portion of the pressure distillate drawn from the receiver HH into the recirculating line Z, the oil then entering the dephlegmator through the spray pipe AA.

The reflux condensate oil from the dephlegmator H, mixed with fresh charging stock, passes through the reflux leg BB, and, by means of the hot oil pump DD, is discharged through pipe connection EE into the coil of heating tubes in the furnace, where it is subjected to cracking conditions.

The dephlegmator H is of the perforated pan type, which gives efficient contact of oil and vapor. The use of charging stock and pressure distillate oil as cooling means secures a refluxing action in the dephlegmator so that the light hydrocarbon vapors leaving the top of the dephlegmator through line FF may be of any quality desired. This light hydrocarbon vapor is condensed to a liquid as pressure distillate or crude gasolene in the cooling coil GG, from which it passes into receiver HH, maintained under the operating pressure of the system. The pressure distillate discharges through the meter SS into a gas separating chamber JJ, from which it flows to a storage tank through the trap

**TABLE 1**

**CRACKING OF GREEN RIVER, WYOMING SHALE OIL**

**Properties of the Initial Oil**

| | |
|---|---|
| Specific gravity | 0.9352 |
| Flash point, °C. (Cleveland Open Cup) | 127 |
| Fire point, °C. (Cleveland Open Cup) | 138 |
| Viscosity (Saybolt Furol), sec. at 50°C. (122°F.) | 20 |
| Sulphur, percent | 1.1 |

**Distillation Analysis (A. S. T. M.)**

| | °C |
|---|---|
| Initial B. P. | 252 |
| Percent distilled over 10 | 277 |
| Percent distilled over 20 | 306 |
| Percent distilled over 30 | 337 |
| Percent distilled over 40 | 349 |
| Percent distilled over 50 | 373 |
| Percent distilled over 60 | 377 |
| Percent distilled over 70 | 381 |
| Percent distilled over 80 | 387 |
| Percent distilled over 90 | 391 |
| Coke, percent by weight | 5.4 |

**Cracking Conditions**

| | Non-residual Oil Basis | Residual Oil Basis |
|---|---|---|
| Pressure (lb. per sq. in.) | 120 | 120 |

**Products and Yields Based on Charging Stock**

| | | |
|---|---|---|
| Pressure distillate yield, percent | 65.5 | 50 |
| Specific gravity | 0.7852 | 0.7883 |
| Residuum, percent | ..... | 35.4 |
| Specific gravity | ..... | 0.9672 |
| Coke (lb. per bbl.) | 66 | 45 |
| Gas (cu. ft. per bbl.) | 650 | 400 |

**Properties of the Cracked Gasoline**

| | | |
|---|---|---|
| Yield, percent | 52.9 | 35.2 |
| Specific gravity | 0.7741 | 0.7690 |
| Initial B. P., °C | 223 | 226 |
| Sulphur, percent | 0.71 | 0.70 |
| Doctor sweet | Yes | Yes |
| Non-corrosive | Yes | Yes |
| Color | W.W. | W.W. |

**Properties of the Furnace or Diesel Oil**

| | | |
|---|---|---|
| Specific gravity | 0.9024 | 0.8973 |
| Initial B. P. | 232 | 232 |
| End B. P. | 377 | 391 |

**TABLE 2**

**CRACKING OF UTAH SHALE OIL**

**Properties of the Initial Oil**

| | |
|---|---|
| Specific gravity | 0.9402 |
| Flash point (Cleveland Open Cup) °C | 82 |
| Fire point (Cleveland Open Cup) °C | 93 |
| Viscosity (Saybolt Furol) sec. at 25°C | 70 |
| B. S. (benzol), percent | 0.7 |
| Sulphur, percent | 0.77 |
| Nitrogen, percent | 2.08 |

**Distillation Analysis (A. S. T. M.)**

| | °C |
|---|---|
| Initial B. P. | 160 |
| Percent distilled over 10 | 232 |
| Percent distilled over 20 | 274 |
| Percent distilled over 30 | 308 |
| Percent distilled over 40 | 344 |
| Percent distilled over 50 | 369 |
| Percent distilled over 60 | 385 |
| Percent distilled over 70 | 391 |
| Percent distilled over 80 | 399 |
| Coke, percent, by weight | 3.7 |

**Cracking Conditions**

| | Non-residual Oil Basis | Residual Oil Basis |
|---|---|---|
| Pressure, lb. per sq. in. | 120 | 120 |
| Liquid temperature, °C | 438 | 416 |

**Products and Yields, based on the Charging Stock**

| | | |
|---|---|---|
| Pressure distillate oil yield, percent | 69.9 | 50.2 |
| Specific gravity | 0.7936 | 0.7699 |
| Residuum yield, percent | ..... | 33.0 |
| Specific gravity | ..... | 0.9847 |
| Coke, lb. per bbl. | 85 | 50 |
| Gas, cu. ft. per bbl. | 624 | 390 |

**Properties of the Cracked Gasolene**

| | | |
|---|---|---|
| Yield, percent | 52.1 | 44.3 |
| Specific gravity | 0.7749 | 0.7715 |
| Initial B. P., °C | 49 | 54 |
| End B. P., °C | 224 | 224 |
| Sulphur, percent | 0.35 | 0.35 |
| Doctor sweet | Yes | Yes |
| Non-corrosive | Yes | Yes |
| Benzol equivalent before treatment, percent | 35 | 25 |
| Benzol equivalent after treatment, percent | 15 | 10 |
| Color | W. W. | W. W. |

**Properties of Furnace or Diesel Oil**

| | | |
|---|---|---|
| Yield, percent | 14.3 | 3.4 |
| Specific gravity | 0.9242 | 0.9365 |
| Initial B. P., °C | 229 | 241 |
| End B. P., °C | 354 | 346 |

TABLE 3

PROPERTIES OF MONTEREY, CALIF., SHALE OIL

| | |
|---|---|
| **Properties of Initial Oil** | |
| Specific gravity | 0.9868 |
| Flash point, °C. (Cleveland Open Cup) | 102 |
| Fire point, °C. | 121 |
| Viscosity (Saybolt Furol) sec. at 25°C. | 84 |
| Sulphur, percent | 6.8 |
| Nitrogen, percent | 0.5 |
| **Distillation Analysis (A. S. T. M.)** | |
| | °C. |
| Initial B. P. | 221 |
| Percent distilled over 10 | 275 |
| Percent distilled over 20 | 302 |
| Percent distilled over 30 | 341 |
| Percent distilled over 40 | 358 |
| Percent distilled over 50 | 373 |
| Percent distilled over 60 | 381 |
| Percent distilled over 70 | 386 |
| Percent distilled over 80 | 399 |
| Percent distilled over 90 | 371 |
| End B. P. | 405 |
| Coke, percent by weight | 7.5 |
| **Cracking Conditions** | |
| Pressure, lb. per sq. in. | 80 |
| Liquid temperature, °C. | 404 |
| **Products and Yields, Based on the Charging Stock** | |
| Pressure distillate yield, percent | 60.9 |
| Specific gravity | 0.8358 |
| Residuum, percent | ..... |
| Coke, lb. per bbl. | 115 |
| Gas, cu. ft. per bbl. | 680 |
| **Properties of the Cracked Gasolene** | |
| Yield, percent | 40.0 |
| Specific gravity | 0.8251 |
| Initial B. P., °C. | 47 |
| End B. P., °C. | 225 |
| **Properties of Furnace or Diesel Oil** | |
| Yield, percent | 20.2 |
| Specific gravity | 0.9350 |
| Initial B. P., °C. | 224 |
| End B. P., °C. | ..... |

TABLE 4

CRACKING OF SCOTTISH SHALE OIL

| | | | |
|---|---|---|---|
| **Properties of the Initial Oil** | | | |
| Specific gravity | | | 0.8866 |
| Sulphur, percent | | | 0.55 |
| Tar acids, percent | | | 15.6 |
| Tar bases, percent | | | 14.4 |
| **Distillation Analysis (A. S. T. M.)** | | | |
| | | | °C. |
| Initial B. P. | | | 188 |
| Percent distilled over 10 | | | 222 |
| Percent distilled over 20 | | | 253 |
| Percent distilled over 30 | | | 287 |
| Percent distilled over 40 | | | 254 |
| Percent distilled over 50 | | | 385 |
| Percent distilled over 60 | | | 384 |
| Percent distilled over 70 | | | 371 |
| Percent distilled over 80 | | | 360 |
| Percent distilled over 90 | | | 353 |
| End B. P. | | | 386 |
| Coke, percent by weight | | | 6.1 |
| **Cracking Conditions** | | Non-residual Oil Basis | Residual Oil Basis |
| Pressure, lb. per sq. in. | | 120 | 120 |
| Liquid temperature, °C. | | 432 | 421 |
| **Products and Yields Based on the Charging Stock** | | | |
| Pressure distillate yield, percent | | 80.6 | 60.6 |
| Specific gravity | | 0.7887 | 0.7732 |
| Composition, in percent: | | | |
| Tar acids | 1.2 | | |
| Tar bases | 3.9 | | |
| Unsaturated hydrocarbons absorbed by 80 percent sulphuric acid | 16.9 | | |
| Absorbed by 95 percent sulphuric acid | 25.1 | | |
| Sulphur, percent | 0.40 | | |
| Residuum, percent | | ..... | 21.8 |
| Specific gravity | | ..... | 0.9652 |
| Coke, lb. per bbl. | | 42 | 33 |
| Gas, cu. ft. per bbl. | | 470 | 325 |
| **Properties of the Cracked Gasolene** | | | |
| Yield, percent | | 59.2 | 49.6 |
| Specific gravity | | 0.7715 | 0.7711 |
| Initial B. P., °C. | | 44 | 49 |
| End B. P., °C. | | 226 | 226 |
| Sulphur, percent | | 0.19 | 0.19 |
| Doctor sweet | | Yes | Yes |
| Non-corrosive | | Yes | Yes |
| Color | | W. W. | W. W. |
| Benzol equivalent, percent | | 10 | 10 |
| **Properties of Furnace or Diesel Oil** | | | |
| Yield, percent | | 18.2 | 7.9 |
| Specific gravity | | 0.8838 | 0.8718 |
| Initial B. P., °C. | | 227 | ..... |
| End B. P. | | 363 | ..... |

LL. The operating pressure on the system is controlled by the gas valve RR through which gas in excess of that necessary to maintain the pressure desired, leaves the receiver HH, mixing with that evolved from the pressure distillate due to the reduction of pressure in the separating tank JJ. The gas mixture flows through the line KK and connected pipes to the gasolene absorption system or to the burners in furnace F; it may be passed to storage to be converted into chemicals or shipped to gas companies to be blended with gas of low B. t. u. value, such as water gas. If desired, the gas from the receiver HH may be taken off separately from the gas evolved from the pressure distillate in receiver JJ.

## Cracking of Oil from United States Shales

Shale oils obtained by retorting Utah, Wyoming and California shales have been distilled under pressure in such a way as to reproduce the results obtainable under commercial conditions.

### *Cracking of Wyoming Shale Oil*

A topped shale oil from the Green River formation in Wyoming, with a boiling range of 252-391° C., was cracked under a pressure of 120 lb. In a residual oil type operation, a 35 percent yield of U. S. motor gasolene was obtained and in non-residual oil operation 53 percent. The gasolene was water white, doctor sweet, non-corrosive and of anti-detonating quality, equivalent to a 20 percent mixture of benzol with Pennsylvania straight-run gasolene. A detailed analysis of the cracking runs is presented in the data in Table 1.

### *Cracking of Utah Shale Oil*

A somewhat heavier shale oil from Utah was cracked at a pressure of 120 lbs. In a residual oil type operation at about 416° C., 44 percent of gasolene was obtained. Operating on a non-residuum basis at approximately 438° C., the yield of gasolene was 52 percent. The gasolene upon refining was doctor sweet, noncorrosive and water white in color. It had excellent anti-knock properties, which were markedly reduced during treatment. Chemical treatment of the non-residual type operation gasolene reduced its benzol value from 35 to 15 percent. The gasolene from the residual oil type operation depreciated from 25 to 10 percent.

Full details of the cracking are presented in the tabulation in Table 2.

### *Cracking of California Shale Oil*

A shale oil of specific gravity 0.9868, from the Monterey area in California, was cracked, using 80-lb. pressure and a temperature of about 760° F. on a non-residual oil basis. Thirty-eight percent of gasolene and 23 percent of gas oil

were obtained. The cracking operation is summarized in Table 3.

### Scotland

The oil shale industry of Scotland is one of the oldest and the most highly developed in the world. The annual retorting of oil shale has been approximately 3,500,000 tons, from which 2,000,000 barrels of shale oil were produced. In view of the tax now levied on imports of gasolene, the cracking of shale oil should become a significant factor in the production of motor fuel.

Scotch shale oil has been cracked in both a non-residual oil and a residual oil type operation. Under an operating pressure of 120 lbs., yields of gasolene of 59 and 50 percent, respectively, were obtained, and in addition furnace or Diesel oil, coke and gas were produced. The gasolene was of good quality as regards color, sweetness and sulphur content, and had low anti-knock properties, being equivalent to a 10 percent blend of benzol with Pennsylvania straight-run gasolene. The detailed data of the cracking operation are shown in Table 4.

*Refining of the Pressure Distillate Oil*

The treatment given the pressure distillate to produce a water white motor fuel consisted of the following steps:

(1) Agitation with about 3 percent by volume of 30° Be. sodium hydroxide solution, adding same in two equal portions, and withdrawal of the sludge. This removed the tar acids and was accompanied by a solution loss of about 1.5 percent.

(2) Thorough washing with water.

(3) Agitation with about 2 percent by volume of 80 percent sulphuric acid, followed by settling and removal of the sludge. The tar bases were here removed with a loss of about 4 percent. The oil should not be washed with water at this point.

(4) Agitation with 4 lbs. per barrel of 66° Be. sulphuric acid, settling and drawing off the sludge.

(5) Agitation with a second 4-lb. portion of sulphuric acid, with removal of the sludge.

(6) Thorough washing with water.

(7) Neutralization with about 1 percent by volume of 16° Be. sodium plumbite solution, followed by settling and drawing off the sludge.

(8) Thorough washing with water.

(9) Distillation in a fire and steam still.

This treatment produced a water white, doctor sweet, non-corrosive and light stable motor fuel, with a sulphur content of 0.19 percent. The treating losses amounted to approximately 12 percent of the volume of the pressure distillate.

*Cracking of Australian Shale Oil*

TABLE 5

PROPERTIES OF THE INITIAL OIL (TOPPED SHALE OIL)

| | |
|---|---|
| Specific gravity | 0.8724 |
| **Distillation Analysis** | |
| | °C. |
| Initial B. P. | 143 |
| Percent distilled over 10 | 194 |
| Percent distilled over 20 | 227 |
| Percent distilled over 30 | 254 |
| Percent distilled over 40 | 278 |
| Percent distilled over 50 | 302 |
| Percent distilled over 60 | 322 |
| Percent distilled over 70 | 346 |
| Percent distilled over 80 | 371 |
| Percent distilled over 90 | 398 |
| Percent distilled over 95 | 421 |
| **Cracking Conditions** | |
| Pressure, lb. per sq. in | 125 |
| Liquid temperature °C | 432 |
| **Products and Yields Based on the Charging Stock** | |
| Pressure distillate yield, per cent | 66.5 |
| Specific gravity | 0.7809 |
| Residuum yield, percent | 27.8 |
| Specific gravity | 1.004 |
| Coke, lb. per bbl | 4.0 |
| Gas, cu. ft. per bbl | 168 |
| **Properties of the Cracked Gasolene** | |
| Yield, percent | 55.3 |
| Specific gravity | 0.7749 |
| Initial B. C., °C | 46 |
| End B. P., °C | 224 |
| **Properties of the Furnace or Diesel Oil** | |
| Yield, percent | 10.1 |
| Specific gravity | 0.8686 |
| Initial B. P., °C | 224 |
| End B. P., °C | 341 |

TABLE 6

CRACKING OF NEW BRUNSWICK (CANADA) SHALE OIL

| | |
|---|---|
| **Properties of Initial Oil** | |
| Specific gravity | 0.9297 |
| Flash point °C. (Cleveland Open Cup) | 104 |
| Fire point, °C | 121 |
| Viscosity (Saybolt Furol) sec., at 25° C | 27 |
| **Distillation Analysis (A. S. T. M.)** | |
| | °C. |
| Initial B. P | 218 |
| Percent distilled over 10 | 248 |
| Percent distilled over 20 | 272 |
| Percent distilled over 30 | 297 |
| Percent distilled over 40 | 322 |
| Percent distilled over 50 | 339 |
| Percent distilled over 60 | 352 |
| Percent distilled over 70 | 366 |
| Percent distilled over 80 | 338 |
| Percent distilled over 90 | 362 |
| Coke, percent by weight | 9.6 |

| **Cracking Conditions** | Non-residual Oil Operation | Residual Oil Operation |
|---|---|---|
| Pressure, lb. per square in | 175 | 150 |
| Liquid temperature, °C | 449 | 429 |
| **Products and Yields Based on Charging Stock** | | |
| Pressure distillate: | | |
| Yield, percent | 64.8 | 51.4 |
| Specific gravity | 0.7741 | 0.7694 |
| Residuum: | | |
| Yield, percent | None | 25.9 |
| Specific gravity | None | 0.9951 |
| Coke, lb. per bll | 82 | 60 |
| Gas, cu. ft. per bbl | 660 | 418 |
| **Properties of Cracked Gasolene** | | |
| Yield, percent | 53.9 | 40.6 |
| Specific gravity | 0.7720 | 0.7624 |
| Initial B. P., °C | 44 | 51 |
| End B. P., °C | 223 | 223 |
| Doctor sweet | Yes | Yes |
| Non-corrosive | Yes | Yes |
| Sulphur, percent | 0.16 | 0.16 |
| Color | W. W. | W. W. |
| Benzol equivalent, percent | 5 | 5 |
| Hydrocarbon analysis in percent: | | |
| Unsaturated | 12.4 | 14.2 |
| Aromatics | 23.1 | 22.0 |
| Naphthenes | 7.7 | 5.3 |
| Paraffins | 56.8 | 58.5 |
| **Properties of the Furnace or Diesel Oil** | | |
| Yield, percent | 6.8 | 7.0 |
| Specific gravity | 0.9236 | 0.9007 |
| Initial B. P., °C | 232 | 229 |
| End B. P., °C | 304 | 357 |

TABLE 7

CRACKING OF AUTUN (FRANCE) SHALE OIL

| | |
|---|---|
| **Properties of Initial Oil** | |
| Specific gravity | 0.8956 |
| **Distillation Analysis (A. S. T. M.)** | |
| | °C. |
| Initial B. P. | 121 |
| Percent distilled over 10 | 196 |
| Percent distilled over 20 | 224 |
| Percent distilled over 30 | 254 |
| Percent distilled over 40 | 291 |
| Percent distilled over 50 | 321 |
| Percent distilled over 60 | 354 |
| Percent distilled over 70 | 382 |
| Percent distilled over 80 | 410 |
| Percent distilled over 90 | 427 |
| End B. P. | 429 |
| **Cracking Conditions** | |
| Pressure, lb. per sq. in. | 120 |
| Liquid temperature, °C. | 426 |
| **Products and Yields Based on Charging Stock** | |
| Pressure distillate: | |
| Yield, percent | 61.0 |
| Specific gravity | 0.7844 |
| Residuum: | |
| Yield | 27.7 |
| Specific gravity | 1.030 |
| Coke, lb. per bbl. | 20 |
| Gas, cu. ft. per bbl. | 252 |
| **Properties of the Cracked Gasolene** | |
| Yield, percent | 51.0 |
| Specific gravity | 0.7762 |
| Initial B. P., °C. | 48 |
| End B. P., °C. | 224 |
| **Properties of the Furnace or Diesel Oil** | |
| Yield, percent | 7.6 |
| Specific gravity | 0.8778 |
| Initial B. P., °C. | 216 |
| End B. P., °C. | 348 |

TABLE 8

| | |
|---|---|
| Specific gravity | 0.9854 |
| Flash point °C. (Cleveland Open Cup) | 60 |
| Fire point, °C. | 90 |
| **Distillation Analysis (A. S. T. M.)** | |
| | °C. |
| Initial B. P. | 157 |
| Percent distilled over 10 | 224 |
| Percent distilled over 20 | 262 |
| Percent distilled over 30 | 300 |
| Percent distilled over 40 | 341 |
| Percent distilled over 50 | 360 |
| Percent distilled over 60 | 368 |
| Percent distilled over 70 | 370 |
| Percent distilled over 80 | 371 |
| Percent distilled over 90 | 349 |
| Coke, percent by weight | 11.8 |

TABLE 9

CRACKING OF ESTHONIAN SHALE OIL

| | Non-residual Oil Basis | Residual Oil Basis |
|---|---|---|
| **Cracking Conditions** | | |
| Pressure, lb. per sq. in. | 140 | 135 |
| Liquid temperature, °C. | 421 | 399 |
| **Products and Yields Based on Charging Stock** | | |
| Pressure distillate oil: | | |
| Yield, percent | 57.3 | 42.5 |
| Specific gravity | 0.8348 | 0.7852 |
| Residuum: | | |
| Yield, percent | None | 18.3 |
| Specific gravity | ..... | 1.018 |
| Coke, lb. per bbl. | 105 | 88 |
| Gas, cu. ft. per bbl. | 974 | 596 |
| **Properties of the Cracked Gasolene** | | |
| Yield, percent | 42.1 | 35.5 |
| Specific gravity | 0.7914 | 0.7818 |
| Initial B. P., °C. | 53 | 49 |
| End B. P., °C. | 223.5 | 223 |
| Doctor sweet | Yes | Yes |
| Non-corrosive | Yes | Yes |
| Color | W. W. | W. W. |
| Benzol equivalent percent | 27 | ..... |
| Hydrocarbon analysis in percent: | | |
| Unsaturated 21.0 | | |
| Aromatic 28.7 | | |
| Naphthene 10.9 | | |
| Paraffin 39.4 | | |
| **Properties of the Furnace or Diesel Oil** | | |
| Yield, percent | 10.0 | 4.2 |
| Specific gravity | 0.9951 | 0.9236 |
| Initial B. P., °C. | 232 | 239 |
| End B. P., °C. | 414 | 377 |

Were a yellow fuel acceptable, the above treatment could be materially shortened. Washing with caustic solution, as in step 1, followed by the application of dilute acid and by use of 2 to 3 lbs. per barrel of 66° Be. sulphuric acid, produced a motor fuel with a color of twenty-one Saybolt, rapidly turning yellow on exposure to sunlight.

### Australia

In Australia, crude-oil production is practically nil; hence the retorting and cracking of oil shale is of the greatest industrial importance.

The deposits of shale, particularly in New South Wales, are extensive and rich, yielding on an average 2.5 barrels of oil per ton of shale. This oil can be cracked into over 50 percent of high anti-knock gasolene. As the known shale deposits of New South Wales alone could produce approximately 300,000,000 barrels of oil, this gives a potential production of 150,000,000 barrels of high anti-knock gasolene.

Tasmania has known oil shale deposits, covering 300 square miles, which contain at least a potential 320,000,000 barrels of shale oil. This could be converted, by cracking under pressure in commercial units, into 165,000,000 barrels of gasolene.

Several Australian shale oils have been cracked. In one run the crude shale oil as derived from retorting, was topped, yielding 16.5 percent gasolene stock, and the residual oil cracked at 125-lb. pressure and about 432° C. A yield of 55 percent gasolene on the topped oil was obtained, making a total gasolene yield of 62 percent of the crude shale oil. The cracking operation and results are described in Table 5.

### Canada

That the oil shale deposits of Canada are enormous is well known, but there is no data available by which their extent may be estimated.

Retorting of a New Brunswick oil shale yielded approximately 47 gallons of oil per ton. The cracking of this oil, after removal of its lighter constituents by topping, produced a high-grade motor fuel.

The cracking was carried out under 150 to 175 lb. pressure, yielding 41 percent of gasolene in residuum operation, and 54 percent in non-residual oil type operation. The gasolene was sweet, low in sulphur, non-corrosive and water white, but rather low in anti-knock value. The data from the cracking operation is as shown in Table 6.

*The refining of the Pressure Distillate Oil*

The chemical treatment of the pressure distillate in order to produce a water white, doctor sweet, non-corrosive and light stable gasolene is outlined below:

(1) Agitate the oil with 3 percent by volume of 30° Bé. sodium hydroxide solution. Then settle, drawing off the sludge.

(2) Wash thoroughly with water.

(3) In order to dry the oil, treat with 1 lb. of 66° Bé. sulphuric acid to the barrel. Allow it to settle and draw off the sludge acid.

(4) Agitate thoroughly with 4 lbs. of sulphuric acid, allow the sludge acid to settle and draw it off.

(5) Follow with a further 5 lbs. of sulphuric acid, agitating thoroughly, permitting the sludge acid to settle and then drawing off.

(6) Wash thoroughly with water, drawing it off after settling.

(7) Neutralize the acid compounds in the pressure distillate oil with about 1 percent by volume of 16° Bé. sodium plumbite solution with thorough agitation. The plumbite solution should be allowed to settle and then drawn off.

(8) Distil the chemically treated oil with fire and steam to finished gasolene. Usually the maximum temperature of the still is 135° C.

### France

As the crude-oil production of France is negligible in quantity, France has endeavored by means of prizes to stimulate the commercial production of motor fuel from sources other than petroleum. Much work has been carried on in the exploitation of the oil-shale resources, which have been worked since 1845. The oil-shale industry has not, however, risen to its highest possibilities. As the government is taking a keen interest in this resource, the future should see advances in this industry with the use of the cracking process.

A sample of Autun shale was cracked at 120-lb. pressure and 426° C. yielding 51 percent of gasolene and about 8 percent of furnace or Diesel oil.* The results are given in detail in Table 7.

### Esthonia

In a monograph on oil shale by Cronshaw, published by the Imperial Institute of Great Britain, there appears the following:

"Deposits of oil shale are known to extend in Esthonia from the west coast, near Port Baltic, to the north shore of Peipus Lake, an approximate distance of 100 miles. The fields have been estimated to contain a total of 40,000 million tons of oil shale. In the eastern section the aggregate thickness of shale is 8 ft. There are five seams in all, varying in thickness from 8 to 30 in. Three occur together, totaling 4 ft. The overburden, soil and chalk, is 6 ft. in thickness. A ton of raw shale with 13.7 percent moisture, yielded 35 cu. ft. of gas and water, which contains acetone, methyl alcohol, acetic acid and ammonia, and about 60 gals. of crude oil, containing 19 percent light and 81 percent heavy oils. A test of Esthonian shale by Schmarn gave the following results by dry distillation":

| | Percent. |
|---|---|
| Oils and tar | 29.07 |
| Gases | 21.33 |
| Coke | 7.64 |
| Ash | 40.15 |
| Water | 1.81 |

Large scale retorting tests were made in the United States on a shipment of Esthonian shale. Approximately 50 gals. of oil per ton of shale was obtained. A portion of this oil was subjected to the cracking process. It had the properties described in Table 8.

In cracking, a non-residual oil run was made at 140-lb. pressure and a residual oil run at 135 lb. The gasolene yields were 42 and 36 percent, respectively, the product being sweet, non-corrosive, water white, and possessing a benzol value of 27 percent. A tabular description of the cracking operation is given in Table 9.

* Morrell and Egloff, Natl. Petroleum News, April 28, 1926.

## ONLY FRESHLY MADE EXPLOSIVES SHOULD BE USED

To promote efficiency in the use of "permissible" explosives, coal-mine operators are urged to make use of only freshly made explosives in their blasting operations, by Dr. Charles E. Monroe, Chief of the Explosives Division of the Bureau of Mines. To make sure of this being done, it is recommended that they purchase permissibles, or have deliveries of them made in such quantities only as can be consumed in blasting in a reasonably short time, say three months, and that permissibles be so stored in magazines that all of the older explosives in a magazine shall be checked out and used before any part of a fresh consignment in the magazine is used.

The testing of explosives for permissibility by the Bureau of Mines began December 3, 1908, and up to April 1, 1928, of the 616 explosives submitted by the manufacturers for test 366 passed and were designated as permissible explosives. For various reasons, chiefly determined by trade conditions, many of these explosives have been withdrawn, removed or transferred so that on April 1, 1928, there were 130 explosives on the permissible list.

It would require much space in which to describe the character of the more significant changes each one of these permissible explosives is likely to undergo with time during storage. To indicate to consumers something of the nature of each explosive, the Bureau of Mines some time ago classified permissible explosives according to the characteristic ingredient each contains, there being Class 1, ammonium nitrate explosives; Class 2, hydrated explosives; Class 3, organic nitrate explosives; Class 4, nitroglycerin explosives, and Class 5, ammonium perchlorate explosives.

Moisture is, perhaps, the chief menace to the permanency of an explosive and it is an ever-present danger. Much effort and care are exercised by the manufacturer to protect the explosive from moisture by enclosing it in a wrapper which is sealed and waterproofed by dipping, and often redipping, in molten paraffin which congeals about the outside of the wrapper. But this device is fragile, so that in handling and packing, and particularly in unpacking by the inexpert, this paraffin coating may become cracked, providing interstices through which moisture may gain access to the explosive. Hence the explosives left in opened and partly empty cases are especially subject to such deterioration. This is even more true of portions of cartridges which have been cut in the making up of charges. Such cut ends should be well wrapped, stored apart from the rest of the explosives and expended as promptly as possible.

## COAL-MINE FATALITIES IN OCTOBER

Accidents at coal mines in the United States in the month of October caused the death of 182 men, according to reports received from State mine inspectors by the Bureau of Mines. Included in this number were 144 deaths which occurred in bituminous mines in various States; the other 38 deaths occurred in the anthracite field of Pennsylvania. The death rate per million tons of coal mined during the month was 3.09, based on a production of 58,914,000 tons, as compared with 3.75 for October, 1927, based on an output of 51,180,000 tons and 192 deaths. The fatality rate for bituminous mines alone was 2.86 for October of the present year, with a production of 50,360,000 tons, and that for anthracite mines was 4.44, with an output of 8,554,000 tons. The corresponding death rates for 1927 were 3.40 for bituminous mines, based on 43,827,000 tons and 149 deaths; and 5.85 for anthracite mines with 43 deaths and 7,353,000 tons.

Reports made to the Bureau for the 10 months from January to October of 1928 show that accidents at all coal mines in the United States resulted in the loss of 1,771 lives. The production of coal during this period was 466,385,000 tons, showing a death rate of 3.80 per million tons as against 3.78 for the same 10 months of 1927.

The record for bituminous mines alone for the 1928 period was 3.47, with 1,400 deaths and 403,334,000 tons produced; while that for anthracite mines was 5.88, with 371 fatalities and 63,051,000 tons output. The same period for 1927 showed a death rate per million tons of 3.41; for anthracite a rate of 6.17.

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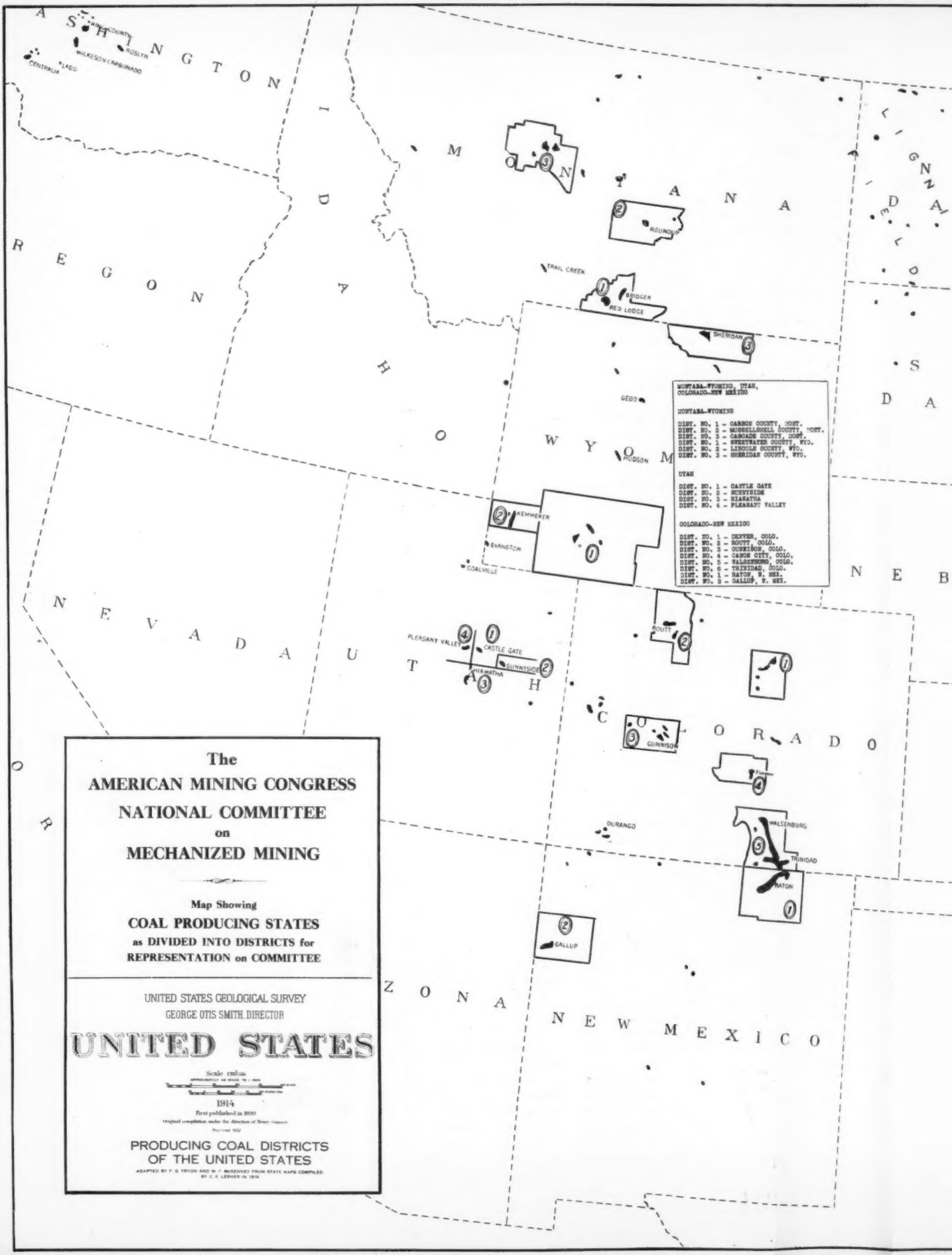



**The**
**AMERICAN MINING CONGRESS**
**NATIONAL COMMITTEE**
**on**
**MECHANIZED MINING**

Map Showing
**COAL PRODUCING STATES**
as DIVIDED INTO DISTRICTS for
REPRESENTATION on COMMITTEE

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

# UNITED STATES

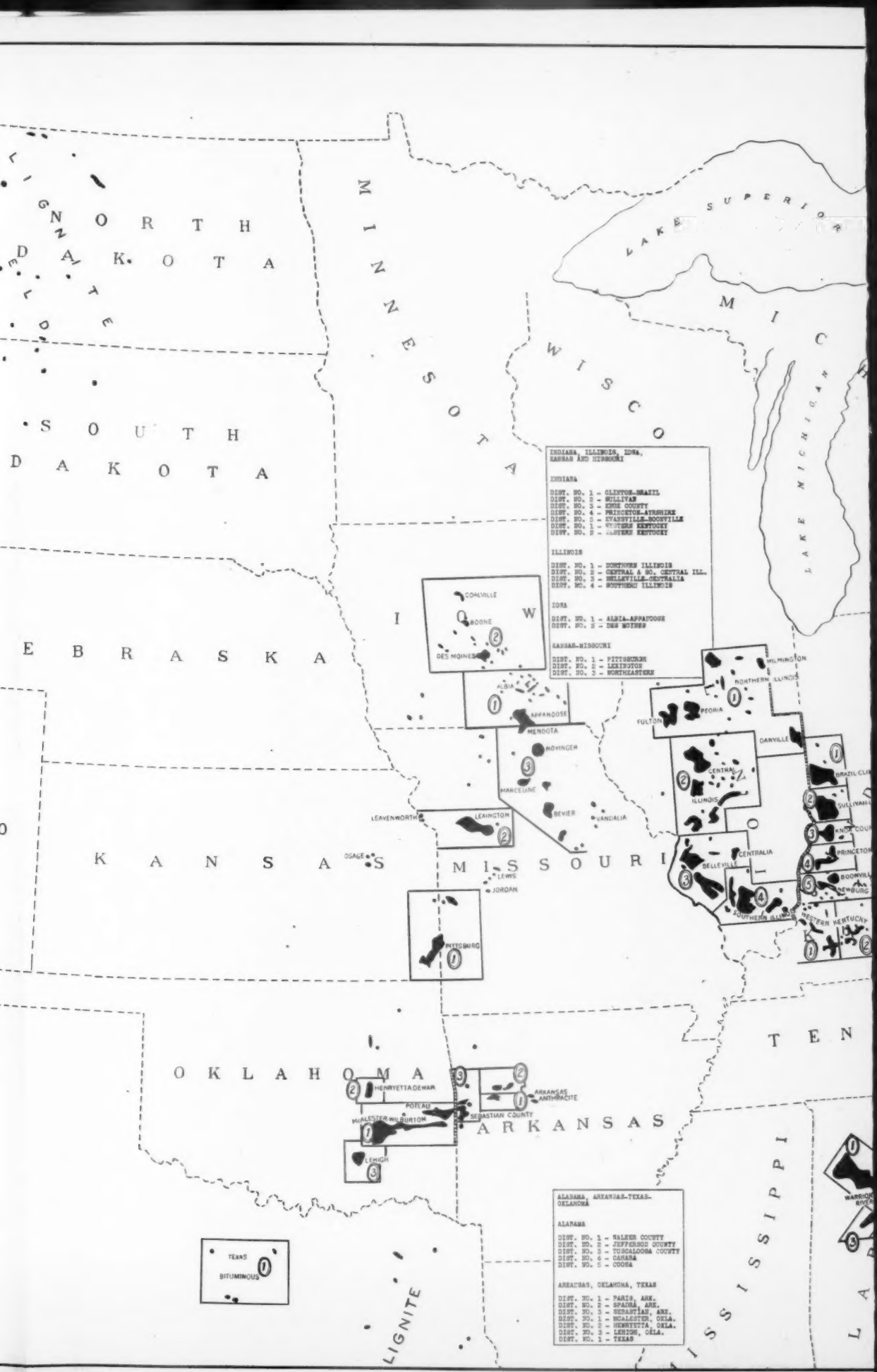
Scale ruled

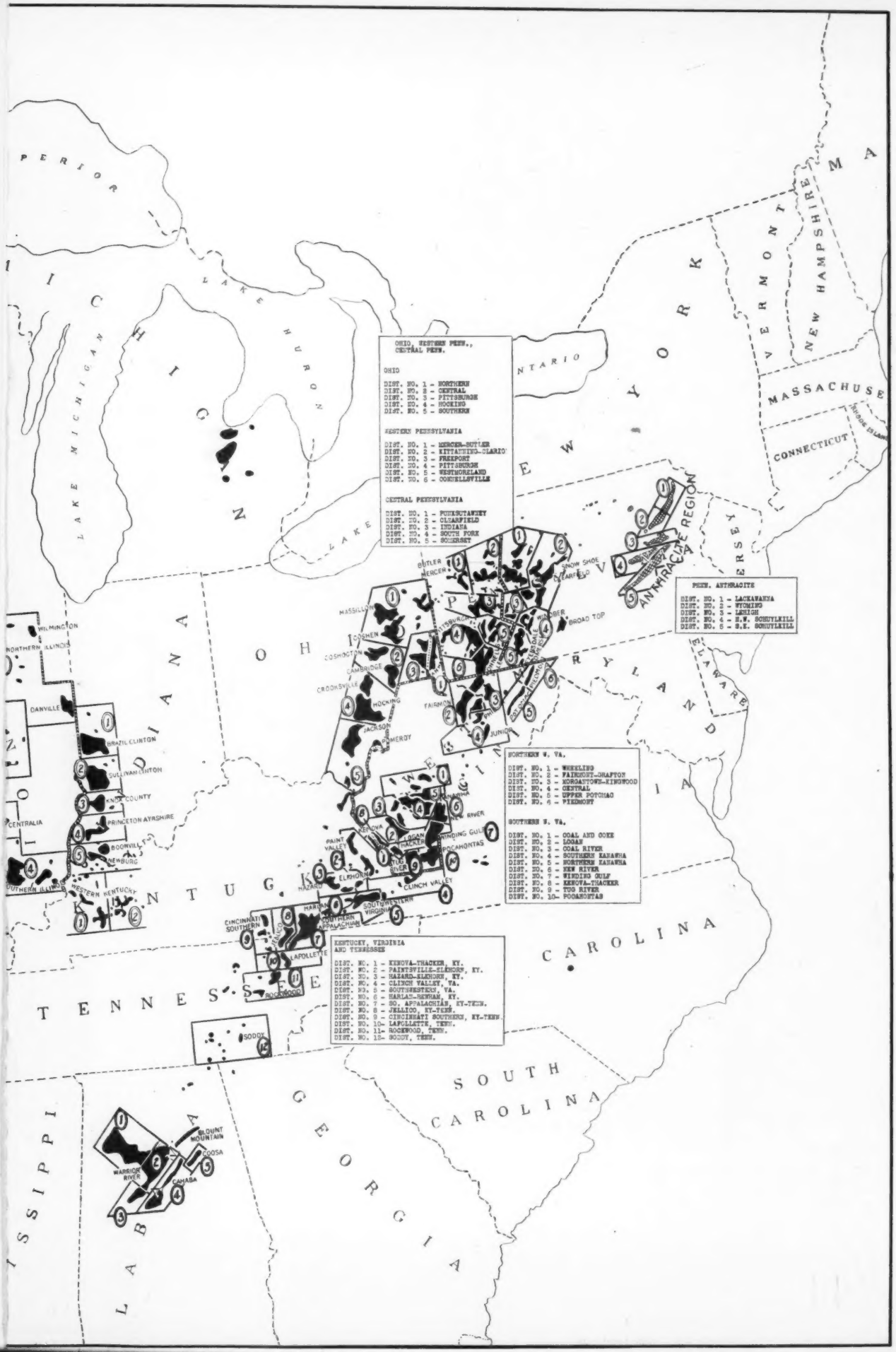
1914

First published in 1930

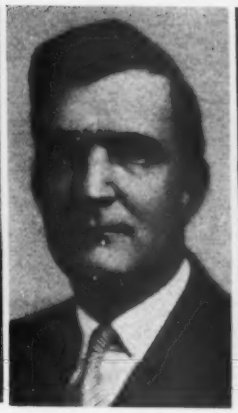
PRODUCING COAL DISTRICTS
OF THE UNITED STATES

ADAPTED BY F. G. TRYON AND W. T. McKENNEY FROM STATE MAPS COMPILED BY C. K. LESHER IN 1919


NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
MINNESOTA
WISCONSIN
LAKE SUPERIOR
LAKE MICHIGAN
IOWA
MISSOURI
ARKANSAS
TEN
MISSISSIPPI
INDIANA, ILLINOIS, IOWA, KANSAS AND MISSOURI
INDIANA
DIST. NO. 1 - CLINTON-BRAZIL
DIST. NO. 2 - SULLIVAN
DIST. NO. 3 - KNOX COUNTY
DIST. NO. 4 - PRINCETON-AYRSHIRE
DIST. NO. 5 - EVANSVILLE-BOONVILLE
DIST. NO. 1 - WESTERN KENTUCKY
DIST. NO. 2 - EASTERN KENTUCKY
ILLINOIS
DIST. NO. 1 - DUNDEE ILLINOIS
DIST. NO. 2 - CENTRAL & SO. CENTRAL ILL.
DIST. NO. 3 - BELLEVILLE-CENTRALIA
DIST. NO. 4 - SOUTHERN ILLINOIS
IOWA
DIST. NO. 1 - ALBIA-APPANOOSE
DIST. NO. 2 - DES MOINES
KANSAS-MISSOURI
DIST. NO. 1 - PITTSBURGH
DIST. NO. 2 - LEXINGTON
DIST. NO. 3 - NORTHEASTERN
COALVILLE
BOONE
DES MOINES
ALBIA
APPANOOSE
MENDOTA
NOVINGER
MARCELINE
LEAVENWORTH
LEXINGTON
BEVIER
VANDALIA
OSAGE
LEWIS
JORDAN
PITTSBURG
WILMINGTON
NORTHERN ILLINOIS
FULTON
PEORIA
DANVILLE
CENTRAL ILLINOIS
BRAZIL CLINTON
SULLIVAN
KNOX COUNTY
PRINCETON
BOONVILLE
NEWBURG
BELLEVILLE
CENTRALIA
SOUTHERN ILLINOIS
WESTERN KENTUCKY
HENRYETTA DEWAR
POTEAU
MCALESTER WILBURTON
LEHIGH
ARKANSAS ANTHRACITE
SEBASTIAN COUNTY
ALABAMA, ARKANSAS-TEXAS-OKLAHOMA
ALABAMA
DIST. NO. 1 - WALKER COUNTY
DIST. NO. 2 - JEFFERSON COUNTY
DIST. NO. 3 - TUSCALOOSA COUNTY
DIST. NO. 4 - CAHABA
DIST. NO. 5 - COOSA
ARKANSAS, OKLAHOMA, TEXAS
DIST. NO. 1 - PARIS, ARK.
DIST. NO. 2 - SPIRO, ARK.
DIST. NO. 3 - SEBASTIAN, ARK.
DIST. NO. 1 - MCALESTER, OKLA.
DIST. NO. 2 - HENRYETTA, OKLA.
DIST. NO. 3 - LEHIGH, OKLA.
DIST. NO. 1 - TEXAS
TEXAS
BITUMINOUS
LIGNITE


OHIO, WESTERN PENN., CENTRAL PENN.
OHIO
DIST. NO. 1 - NORTHERN
DIST. NO. 2 - CENTRAL
DIST. NO. 3 - PITTSBURGH
DIST. NO. 4 - HOCKING
DIST. NO. 5 - SOUTHERN
WESTERN PENNSYLVANIA
DIST. NO. 1 - MERCER-BUTLER
DIST. NO. 2 - KITTANNING-CLARION
DIST. NO. 3 - FREEPORT
DIST. NO. 4 - PITTSBURGH
DIST. NO. 5 - WESTMORELAND
DIST. NO. 6 - CONNELLSVILLE
CENTRAL PENNSYLVANIA
DIST. NO. 1 - PUNXSUTAWNEY
DIST. NO. 2 - CLEARFIELD
DIST. NO. 3 - INDIANA
DIST. NO. 4 - SOUTH FORK
DIST. NO. 5 - SOMERSET
PENN. ANTHRACITE
DIST. NO. 1 - LACKAWANNA
DIST. NO. 2 - WYOMING
DIST. NO. 3 - LEHIGH
DIST. NO. 4 - E.W. SCHUYLKILL
DIST. NO. 5 - E.E. SCHUYLKILL
NORTHERN W. VA.
DIST. NO. 1 - WHEELING
DIST. NO. 2 - FAIRMONT-GRAFTON
DIST. NO. 3 - MORGANTOWN-KINGWOOD
DIST. NO. 4 - CENTRAL
DIST. NO. 5 - UPPER POTOMAC
DIST. NO. 6 - PIEDMONT
SOUTHERN W. VA.
DIST. NO. 1 - COAL AND COKE
DIST. NO. 2 - LOGAN
DIST. NO. 3 - COAL RIVER
DIST. NO. 4 - SOUTHERN KANAWHA
DIST. NO. 5 - NORTHERN KANAWHA
DIST. NO. 6 - NEW RIVER
DIST. NO. 7 - WINDING GULF
DIST. NO. 8 - KENOVA-THACKER
DIST. NO. 9 - TUG RIVER
DIST. NO. 10- POCAHONTAS
KENTUCKY, VIRGINIA AND TENNESSEE
DIST. NO. 1 - KENOVA-THACKER, KY.
DIST. NO. 2 - PAINTSVILLE-ELKHORN, KY.
DIST. NO. 3 - HAZARD-ELKHORN, KY.
DIST. NO. 4 - CLINCH VALLEY, VA.
DIST. NO. 5 - SOUTHWESTERN, VA.
DIST. NO. 6 - HARLAN-BENHAM, KY.
DIST. NO. 7 - SO. APPALACHIAN, KY-TENN.
DIST. NO. 8 - JELLICO, KY-TENN.
DIST. NO. 9 - CINCINNATI SOUTHERN, KY-TENN.
DIST. NO. 10- LAFOLLETTE, TENN.
DIST. NO. 11- ROCKWOOD, TENN.
DIST. NO. 12- SODDY, TENN.
ANTHRACITE REGION
WILMINGTON
NORTHERN ILLINOIS
DANVILLE
BRAZIL CLINTON
SULLIVAN-CLINTON
KNOX COUNTY
CENTRALIA
PRINCETON AYRSHIRE
ROOMVILLE
HENBURG
SOUTHERN ILLINOIS
WESTERN KENTUCKY
BUTLER
MERCER
MASSILLON
COSHOCTON
CAMBRIDGE
CROOKSVILLE
HOCKING
JACKSON
MEIGS
SNOW SHOE
CLEARFIELD
BROAD TOP
FAIRMONT
JUNIOR
KANAWHA
PAINT VALLEY
KENOVA
LOGAN
THACKER
TUG RIVER
WINDING GULF
POCAHONTAS
ELKHORN
HAZARD
CLINCH VALLEY
CINCINNATI SOUTHERN
HARLAN
SOUTHWESTERN VIRGINIA
LAFOLLETTE
ROCKWOOD
SODDY
BLOUNT MOUNTAIN
WARRIOR RIVER
COOSA
CAHABA
OHIO
INDIANA
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
SOUTH CAROLINA
CAROLINA
VIRGINIA
MARYLAND
DELAWARE
NEW JERSEY
NEW YORK
VERMONT
NEW HAMPSHIRE
MASSACHUSE
CONNECTICUT
ONTARIO
LAKE MICHIGAN
LAKE HURON
LAKE

*George F. Peter*
*Ala., District 4*



*Jas. A. Long*
*Ala., District 3*

*T. J. Thompson*
*Ark., District 2*

*H. H. Bubb*
*Colo., District 6*

*Robt. McAllister*
*Colo., District 5*

*Samuel Tescher*
*Colo., District 1*

# NATIONAL COMMITTEE *on* MECHANIZED MINING

***Announcement Is Made Of Appointment Of District Representatives And The Districts Into Which Coal Fields Have Been Divided —Work Of Organization Going Forward Rapidly***

*F. W. Whiteside*
*Colo., District 4*

THE five-year nation-wide survey to be conducted by The American Mining Congress, which was announced in the November issue of this publication, is receiving enthusiastic support throughout the country, and the organization is rapidly nearing completion. This survey will be under the auspices of a National Committee on Mechanized Mining. Dr. L. E. Young, vice president, Pittsburgh Coal Company, is national chairman, and the following named gentlemen will

*Carl J. Fletcher*
*Ind., District 3*

*Lee Haskins*
*Ind., District 1*

*Wellington O'Connor*
*Ind., District 2*

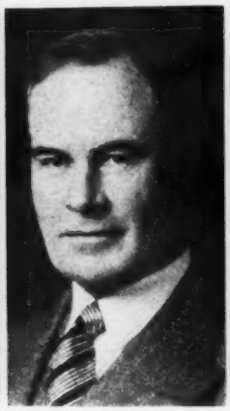
*J. R. Henderson*
*Ind., District 4*

*T. C. Mullins*
*Ind., District 5*

*Henry Pfening*
*Ky.-Tenn., District 7*

*L. C. Skeen*
*Ky., District 1*

*Hugh P. Finley*
*Ky.-Tenn., District 8*



*J. E. Butler*
*Ky.-Tenn., District 9*

*W. G. Snyder*
*Md., District 6*

act as members of the General committee:

NATIONAL CHAIRMAN — L. E. Young, vice president, Pittsburgh Coal Company, Pittsburgh, Pa.

*Alabama:* D. A. Thomas, president and treasurer, Montevallo Coal Mining Company.

*Arkansas and Oklahoma:* J. G. Puterbaugh, president, McAlester Fuel Company.

*Colorado and New Mexico:* D. A. Stout, chief engineer of mines, Colorado Fuel and Iron Company.

*Illinois:* L. D. Smith, vice president, Chicago, Wilmington and Franklin Coal Company.

*Indiana:* David Ingle, president, Ayrshire Coal Company.

*Iowa, Missouri and Kansas:* (To be announced later.)

*Virginia, Kentucky and Tennessee:* R. E. Taggart, vice president, Stonega Coke & Coal Co., Big Stone Gap, Va.

*Ohio:* Ezra Van Horn, general manager, Clarkson Coal Mining Company.

*Pennsylvania (Western):* W. L. Affelder, assistant to the president, Hillman Coal and Coke Company.

*Pennsylvania (Central):* E. J. Newbaker, general manager, Berwind White Coal Mining Company.

*Pennsylvania (Anthracite):* J. B. Warriner, vice president, Lehigh Coal and Navigation Company.

*Utah:* D. D. Muir, vice president, United States Smelting, Refining and Mining Company.

*West Virginia (Southern):* M. L. Garvey, general manager, New River Company.

*West Virginia (Northern) and Maryland:* F. R. Lyon, vice president, Consolidation Coal Company.

*Wyoming and Montana:* Edward Bottomley, general superintendent, Sheridan-Wyoming Coal Company.

GENERAL CHAIRMEN

*Cutting and Shearing:* George Campbell, assistant to president, Old Ben Coal Corporation.

*Drilling and Blasting:* E. E. Jones, manager, Lillybrook Coal Company.

*Mechanical Loaders:* Paul Weir, vice president, Bell and Zoller Coal and Mining Company.

*Conveyors:* Newell G. Alford, consulting engineer, Pittsburgh, Pa.

*Scrapers:* Cadwallader Evans, general manager, Hudson Coal Company.

*Transportation:* R. L. Ireland, general manager, M. A. Hanna, Bituminous Coal Mines.

*Ventilation:* (To be announced later.)

*Power:* R. M. Watt, Kentucky Utilities Co., Pineville, Ky.

*Roof Action:* R. Y. Williams, consulting engineer, Pottsville, Pa.

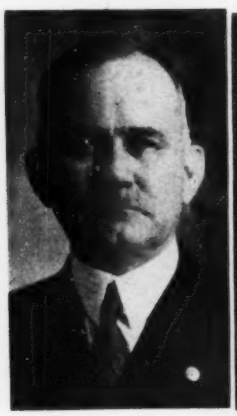
*Coal Cleaning:* H. D. Smith, assistant to president, Ashland Coal and Coke Company.

*Management:* W. D. Brennan, general manager, Phelps Dodge Corporation, Stag Canon Branch.

*Safety:* Thomas Dawson, vice president, H. C. Frick Coke Company.

*Yearbook:* A. C. Callen, School of Mines, University of Illinois.

Dr. Young has just announced that the committee has completed its work in dividing the coal fields into convenient units to expedite the gathering of information, and to simplify the work of the state chairmen. There will be 94 districts, each with an official representative, or observer. These are as follows (The



*Frank A. Young*
*New Mexico*
*District 1*

*Horace Moses*
*New Mexico*
*District 2*

*E. P. Humphrey*
*Penna. Anthracite*
*District 3*

*W. H. Lesser*
*Penna. Anthracite*
*District 4*

*T. F. McCarthy*
*Central Penna.*
*District 5*

*S. W. Blakslee*
*Central Penna.*
*District 4*

*F. B. Dunbar*
*Central Penna.*
*District 5*

*A. B. Kelley*
*West Penna.*
*District 5*

*W. D. Puterbaugh*
*Texas*
*District 1*

*I. N. Bayless*
*Utah*
*District 4*

names of those appearing in black face type have already accepted the invitation to serve as district representatives. At the time we go to press the others have not definitely been heard from):

ALABAMA

This state has five districts. D. A. Thomas, Montevallo Coal Company, Birmingham, is state chairman, and the districts, with their official representatives, forming his state committee are as follows:

1. Walker County.—**Milton H. Fies**, De Bardeleben Coal Corp.

2. Jefferson County.—**Morris W. Bush**, Alabama By-Products Corp.

3. Tuscaloosa County.—**J. A. Long**, Woodward Iron Co.

4. Cahaba.—**Geo. F. Peter**, Southern Coal & Coke Co.

5. Coosa.—**B. F. De Bardeleben**, Markeeta Coal Co.

COLORADO AND NEW MEXICO

It has been found advisable to make the division for Colorado and New Mexico, six for Colorado and two for New Mexico, and this group has as its chairman D. A. Stout, of the Colorado Fuel and Iron Company.

1. Denver.—**Sam Tescher**, National Fuel Co.

2. Routt.—**R. M. Perry**, Moffat Coal Co.

3. Gunnison.—**Robert Williams, Jr.**, Calumet Fuel Co.

4. Canon City.—**F. W. Whiteside**, Victor-American Fuel Co.

5. Walsenburg.—**Robert McAllister**, Colorado Fuel & Iron Co.

6. Trinidad.—**H. H. Bubb**, American Smelting & Refining Co.

1. Raton.—**F. A. Young**, St. Louis, Rocky Mountain & Pacific Co.

2. Gallup.—**H. D. Moses**, Gallup American Coal Co.

ILLINOIS

The logical division here has been found to be Northern, Central and South Central, Belleville and Southern; this group of divisions has as state chairman L. D. Smith, of the Chicago, Wilmington and Franklin Coal Company.

1. Northern.—**A. F. Allard**, U. S. Fuel Co.

2. Central and Southern Central.—**C. W. Clark**, Standard Oil Co.

3. Belleville.—**W. F. Davis**, Southern Coal, Coke & Mining Co.

4. Southern.—**T. J. Thompson**, Valier Coal Co.

INDIANA

David Ingle, of the Ayrshire Coal Company, chairman for Indiana, has five divisions in his state and two in western Kentucky.

1. Clinton-Brazil.—**Lee Haskins, J. K. Dering** Coal Co.

2. Sullivan.—**Wellington O'Connor**, Ogle Coal Co.

3. Knox County.—**Carl J. Fletcher**, Old Knox Mining Co.

4. Princeton-Ayrshire.—**J. R. Henderson**, Francisco Coal Co.

5. Evansville-Boonville.—**T. C. Mullins**, Sunlight Coal Co.

1. Western Ky.—**T. E. Jenkins**, West Kentucky Coal Co.

2. Western Ky.—**W. G. Duncan**, W. G. Duncan Coal Co.

KENTUCKY, VIRGINIA, TENNESSEE

The states of Tennessee, Virginia, and eastern Kentucky form one group under the chairmanship of R. E. Taggart, of the Stonega Coke and Coal Company, and here the division has been made into 12 districts.

1. Kenova-Thacker, Ky.—**L. C. Skeen**, Fordson Coal Co.

2. Paintsville-Elkhorn, Ky.—

3. Hazard-Elkhorn, Ky.—**C. H. McCullough**, Consolidation Coal Co.

4. Clinch Valley, Va.—**Lee Long**, Clinchfield Coal Corp.

5. Southwestern, Va.—**J. M. Thorn**, Blackwood Coal & Coke Co.

6. Harlan-Benham, Ky.—**R. E. Galbreath**, Wisconsin Steel Co.

7. So. Appalachian, Ky.-Tenn.—**Henry Pfening**, Blue Diamond Coal Co.

8. Jellico, Ky.-Tenn.—**H. P. Finley**, The Procter Coal Co.

9. Cincinnati, So. Ky.-Tenn.—**J. E. Butler**, Stearns Coal & Lumber Co.

10. La Follette, Tenn.—**W. R. Peck**, Black Diamond Coal & Mining Co.

*H. W. Showalter*
*N. W. Va., District 3*

*Harry S. Gay*
*So. W. Va., District 2*

*R. E. Miller*
*Wyo., District 3*

11. Rockwood, Tenn.—
12. Soddy, Tenn.—

MISSOURI, KANSAS, IOWA

This group has been divided into five districts, three of which are in Kansas and Missouri and two in Iowa.

OHIO

Under the chairmanship of Ezra Van Horn, of the Clarkson Coal Mining Company, there are five divisions for handling the work in Ohio.

1. Northern.—E. L. Thrower, Warner Collieries Co.
2. Central.—**Wm. Emery, Jr.**, Cambridge Collieries Co.
3. Pittsburgh.—E. J. Christy, Wheeling Township Coal Mining Co.
4. Hocking.—Wm. E. Tytus, Sunday Creek Coal Co.
5. Southern.—Pittsburgh Coal Co.

PENNSYLVANIA

This state, which, as previously announced, is to have three chairmen—Messrs. W. L. Affelder, E. J. Newbaker, and J. B. Warriner, for Western, Central and Anthracite fields, respectively—has been further divided into districts. Western Pennsylvania has six districts, central Pennsylvania five, and the anthracite field five.

*Pennsylvania, Anthracite*—J. B. Warriner, chairman:

1. Lackawanna.—**Jos. Mayers**, Scranton Coal Co.
2. Wyoming.—Paul Sterling, Lehigh Valley Coal Co.
3. Lehigh.—**E. P. Humphrey**, Hazel Brook Coal Co.
4. N. W. Schuylkill.—**W. H. Lesser**, Madeira, Hill & Co.
5. S. E. Schuylkill.—R. E. Hobart, Lehigh Coal & Navigation Co.

*Central Pennsylvania*—E. J. Newbaker, chairman:

1. Punxsutawney.—L. W. Householder, Rochester & Pittsburgh Coal Co.
2. Clearfield.—R. J. Protzeller.
3. Indiana.—**T. F. McCarthy**, Clearfield Bituminous Coal Corp.
4. South Fork.—**S. W. Blakslee**, Pennsylvania Coal & Coke Corp.
5. Somerset.—**F. B. Dunbar**, Hillman Coal & Coke Co.

*Western Pennsylvania*—W. L. Affelder, chairman:

1. Mercer-Butler.—W. P. Vance, Butler Consolidated Coal Co.
2. Kittanning-Clarion.—Fred Norman, Allegheny River Coal Mining Co.
3. Freeport.—W. G. Fletcher, Inland Collieries Co.
4. Pittsburgh.—Pittsburgh Coal Co.
5. Westmoreland.—**A. B. Kelley**, Humphreys Coal & Coke Co.

*G. B. Southward, engineer in charge of the Mechanization Survey*

6. Connellsville.—**L. A. Weise**, South Fayette Coal Co.

TEXAS, OKLAHOMA, ARKANSAS

For Oklahoma, Texas, and Arkansas, with J. G. Puterbaugh, of the McAlester Fuel Company, as chairman, the division has been made as follows: Three for Arkansas, three for Oklahoma, and one for Texas, the Texas Bituminous Field.

1. Paris.—Heber Denman, Paris Purity Coal Co.
2. Spadra.—**T. J. Thompson**, Arkansas Mining Co.
3. Sebastian.—R. A. Welch, Greenwood Coal Co.
1. McAlester.—H. C. Rice, Milby & Dow Coal & Mining Co.
2. Henryetta.—Wm. Steckelberg, Atlas Coal Co.
3. Lehigh.—R. L. Reager, Keystone Coal & Mining Co.
1. **W. D. Puterbaugh**, Malakoff Fuel Co.

UTAH

The four divisions in Utah are the ones commonly made in referring to the coal fields of that state, where Mr. D. D. Muir, of the Utah Fuel Company, is chairman.

1. Castle Gate.—J. H. Tonken, Independent Coal & Coke Co.
2. Sunnyside.—L. F. Rains, Columbia Steel Corp.
3. Hiawatha.—J. B. Forrester, U. S. Fuel Co.
4. Fleasant Valley.—I. N. **Bayless**, Utah Fuel Co.

WEST VIRGINIA

This state is divided into two portions, each under a state chairman, Messrs. F. R. Lyon and M. L. Garvey for northern West Virginia and southern West Virginia, respectively. Here the district division is: Northern West Virginia six, and southern West Virginia ten.

*Northern West Virginia and Maryland*—F. R. Lyon, chairman:

1. Wheeling.—Jas. H. Gibson, Wheeling Steel Corp.
2. Fairmont-Grafton.—John M. Jamison, Jamison Coal & Coke Co.
3. Morgantown-Kingwood.—**H. W. Showalter**, Continental Coal Co.
4. Central.—**C. L. Chapman**, W. Va. Coal & Coke Co.
5. Upper Potomac.—J. B. Jefferies, Davis Coal & Coke Co.
6. Piedmont.—**W. C. Snyder**, Consolidation Coal Co.

*Southern West Virginia*—M. L. Garvey, chairman:

1. Coal & Coke.—
2. Logan.—**H. S. Gay, Jr.**, The Gay Coal & Coke Co.
3. Coal River.—**H. B. Husband**, Chesapeake & Ohio Railway Co.
4. Southern Kanawha.—E. B. Raiguel, W. Va. Southern Coal Co.
5. Northern Kanawha.—**J. S. McKeever**, Kanawha & Hocking Coal & Coke Co.
6. New River.—E. C. Newhall, New River Coal Co.
7. Winding Gulf.—P. C. Graney, C. C. & B. Smokeless Coal Co.
8. Kenova-Thacker.—**J. M. Tulley**, Crystal Block Coal & Coke Co.
9. Tug River.—
10. Pocahontas.—**Thos. Claggett**, Pocahontas Coal & Coke Co.

WYOMING AND MONTANA

Edward Bottomley, of the Sheridan-Wyoming Coal Company, is the chairman, with three districts for each state.

1. Carbon County.—John Sanderson, Anaconda Copper Mining Co.
2. Mussellshell.—E. T. Mattox, Roundup Coal Mining Co.
3. Cascade County.—R. G. Brown, Cottonwood Coal Co.
1. Sweetwater County.—**F. V. Hicks**, Union Pacific Coal Co.
2. Lincoln County.—Garner **Reese**, Kemmerer Coal Co.
3. Sheridan County.—**R. E. Miller**, Sheridan-Wyoming Coal Co.

This district division covers the principal coal-producing states of the country and is shown clearly on The American Mining Congress map accompanying this article. The division has been made as carefully as possible with the idea of grouping the fields logically for the convenience of the district representatives for reporting local improvements.

It is in the recognition of the evolutionary condition in which the coal industry at present finds itself that these leaders have welcomed the opportunity which this ex- (*Continued on page* 918)

# METALS

GUY N. BJORGE
*Editor*

***Practical Operating Problems of the Metal Mining Industry***

# STRIPPING PROBLEMS *on the* MESABA RANGE

*By* F. H. HOLLADAY *

***Factors Contributing To Stripping Problems Are Area To Be Stripped At Surface, And Area Of Ore-Body After Stripping — Maximum, Minimum And Average Grade And Curvatures Over Which Locomotives Operate, and Total Length Of Haul***

IN MEETING the problems encountered in stripping operations on the Mesaba Range in northern Minnesota, where my company (Winston Dear Company) has operated continuously since 1893, it was necessary to employ the latest and best type of equipment as developed latterly involving large investments, the evolution of which follows and may be interesting:

1st. Cars of one cubic yard capacity, hand dump, 24-in. gauge, loaded by hand labor, hoisted up incline by steam and hauled to the dump by horses over 20-lb. rail.

2nd. Cars of one cubic yard capacity, hand dump, 24-in. gauge, loaded by power shovel, hoisted up incline by steam, and to the dump by horses over 20-lb. rail.

3rd. Cars of 1½-cu. yd. capacity, hand dump, 24-in. gauge, loaded by power shovel, 8-ton locomotives, using 30 to 35-lb. rail.

4th. Cars of 3-cu. yd. capacity, hand dump, 36-in. gauge, loaded by power shovel, 2-cu. yd. capacity, 12-ton locomotives, using 40 to 45-lb. rail.

5th. Cars of 4-cu. yd. capacity, hand dump, 36-in. gauge, loaded by power shovel, 2½-cu. yd. capacity, 12 and 16-ton dinkeys, with 45-lb. rail.

6th. Cars of 4-cu. yd. capacity, hand dump, 36-in. gauge, loaded by power shovel, 18 to 20-ton dinkeys, using generally 45-lb. rail.

7th. Cars of 12-cu. yd. capacity, automatic air dump, loaded by power shovel, 3½-cu. yd. capacity, 45-ton standard gauge locomotives, over 60 to 70-lb. rail.

8th. Cars of 16-cu. yd. capacity, automatic air dump, loaded by power shovel, 4-cu. yd. capacity, 60-ton locomotives, using 60 to 70-lb. rail.

9th. Cars of 20-cu. yd. capacity, automatic air dump, loaded by full revolving steam shovel, 8-cu. yd. capacity, 80-ton steam locomotives, with 70 to 80-lb. rail.

10th. Cars of 30-cu. yd. capacity, automatic air dump, loaded by full revolving electric shovels, 8-cu. yd. capac-

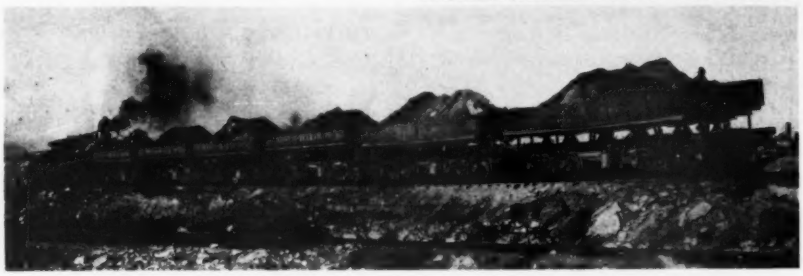
* Vice President, Winston Bros. Company, Minneapolis, Minn.

*The upheaval and condition of the Muskeg swamp after being dumped on. Note that it is pushed out to a point of 650 ft. from the toe of the dump. The Muskeg at this point is anywhere from 15 to 40 ft. in depth.*

*A Marion Shovel loading 1½ yard dump cars, drawn by horses.*

*Model 300 Marion Shovel working in Muskeg, having slid in to a depth of from 10 to 15 ft., or up to the upper frame.*

*Muskeg being dumped from a 20-yd. car.*



*A train of 20-yd. cars going to the dump.*

ity, 60-ton electric locomotives, with 70 to 90-lb. rail.

It may be surprising, and disputed by some, but the fact remains that, in my opinion, under efficient labor conditions, the cost per cubic yard would vary very little, if any, as between the first named method of operating and the last named within haul limitations of 2,000 ft.

The introduction and development of the automobile industry and the increased demand for steel products for building and other purposes made it necessary to employ larger units for the development and operation of the open-pit iron mines, to meet the increased demand for ore in the required time and at the same time be more independent of labor, which, no doubt, would have become quite a problem otherwise.

The elevation of the surface is approximately 1,200 to 1,400 ft. above Lake Superior. The overburden ranges in depth from 5 ft. to 148 ft. However, these extremes are so far removed, one from the other, as not to interfere materially with the operations of the pits, thus enabling the establishing and maintenance of workable railroad grades for hauling the stripping material to the dumps and the ore to the railroad yards.

The material is glacial drift, classified as clay, muskeg and cemented gravel, with "niggerheads" in many instances so tightly cemented into the bank that the teeth of the shovel cuts them in two before they can be completely removed from their resting place. There are also found many large boulders, ranging from ½ cu. yd. to 20 cu. yds. Clay, as a rule, is first encountered, and extends to a depth of 25 to 30 ft. The boulders are more often found embedded between the clay and cemented gravel. Cemented gravel is most usually found underneath clay, or muskeg, and extends to the surface of the ore with slight variations at times due to pockets of softer material such as sand, etc. Muskeg, when encountered, ranges in depth from 5 to 45 ft., and often when wet is of such a consistency as to make it extremely difficult to maintain loading tracks, and where the depth is such that the loading shovel can not get underneath on firm footing more trouble is encountered in operating the shovel. In this class of material it is not uncommon to have slides containing several thousand cubic yards, burying the shovel up to the upper frame, or a depth of from 12 to 15 ft. Under conditions of this kind the full revolving, large capacity shovels prove their worth.

In the early days, in order to make an open pit operation attractive, a ratio of ½ cu. yd. stripping to 1 ton of ore was necessary. At the present time the ratio of 2½ to 1 is common practice where tonnage is sufficient to justify the required capital investment.

In estimating a stripping job the following have to be considered:

The area to be stripped at surface.

The area of the ore body after it is stripped.

Depth of overburden and character of material.

The maximum, minimum and average grade and curvatures over which locomotives, and cars, will have to operate.

The total length of haul to the dump, and the area of the dump ground, and character of the surface upon which the stripping material is to be dumped.

Last, but not least, the capital required to properly equip the job to meet the specification requirements.

The average distance from pits to dumps or spoil banks is somewhere between one and (*Continued on page* 918)

# UNWATERING *the* RED CLOUD SHAFT *of the* SOUTHERN CONSOLIDATED MINES COMPANY

*By* RUSH T. SILL*

THE Bodie Mining District, situated in Mono County, on a high plateau area, midway between the Sierra Nevadas on the west and the Wassuk and Excelsior Mountain ranges, in western Nevada, on the east, is about 12 miles north of Mono Lake and 45 miles west of Thorne, Nev., the nearest railway point.

The mineral belt of the Bodie District is about 2½ miles long and from one-quarter to one-half mile wide, extending northerly and southerly along the crest of steeply sloping hills.

Although no production is now being made, at the height of the activity from 1877 to 1882 32 companies were operating and several milling plants were erected. Among the largest producers were the Syndicate, the Standard, the Bodie, the Mono and the Noonday mines.

A peculiarity of the Bodie District is the difference in the kind of ores produced at near-by mines. The Syndicate, Standard, Bodie, Mono, Noonday, and Red Cloud mines produced free milling gold ores, low in silver values, while the Oro and Addenda on Silver Hill midway between the Noonday and the Mono properties developed sulphide ores, tetrahedrite, chalcopyrite and pyrite, high in silver and low in gold content. With the then known metallurgical processes only the free milling gold ores could be treated.

### HISTORY OF THE BODIE MINING DISTRICT

Gold was first discovered and the Bodie District was organized July 10, 1860. This excitement was short-lived, and the camp was quiet until 1867, when there was another rush to the district and several small properties started development, but it was not until 1877 that the rich gold ore on Standard Hill was discovered, which brought on a boom bringing the population of the camp up to 9,000.

There were over 32 companies operating in this district, many of them on one claim 100 ft. wide and 1,500 ft. long.

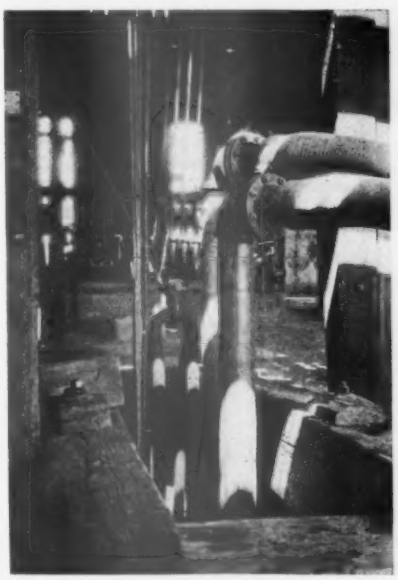
By 1882 many of the small companies had been grouped together into larger properties and all but the larger mines had stopped working. Some of the famous mines on Standard Hill were the Syndicate, the Standard, the Mono and the Bodie, and on Silver Hill the Oro, Addenda, Noonday and Red Cloud.

The gross production of these properties is estimated to have close to $50,000,000.

The camp was prosperous and worked continuously until 1917, when the Standard property, through litigation, lost most of its rich vein system.

* Consulting Engineer of Mines, New Monte Cristo Mining Company, Los Angeles, Calif.

*History Of Bodie Mining District — Type Of Equipment Used In Unwatering—Problems Encountered And Method Of Solving*



### GEOLOGY

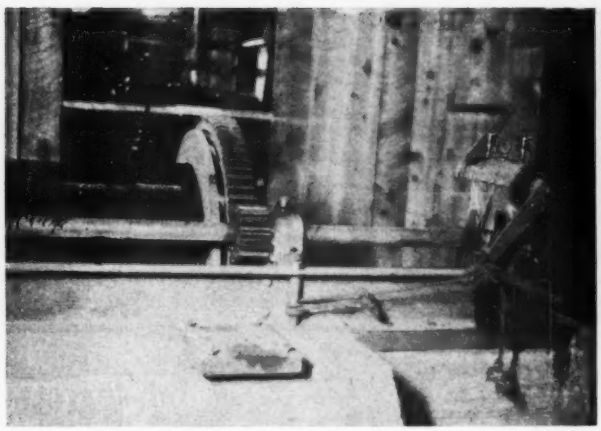
Immediately east of the town of Bodie there occurs a batholitic intrusion of holochrystallyne hornblende andesite in the finer grained andesitic basic lavas, which generally cover the entire section. This whale-shaped hornblende and andesite batholith is approximately 3 miles long and lies in a northeasterly and southwesterly position as exposed. The northern 2 miles of this batholith is approximately three-fourths of a mile wide and extending southerly rapidly contracts to an average width of three-eighths of a mile for the southern 1 mile, ending in a fish-tailed cropping. There is a striking contrast in the coloring of the two surface andesites—the hornblende andesitic intrusion weathers to a reddish brown, whereas the andesite lavas weather to a pink.

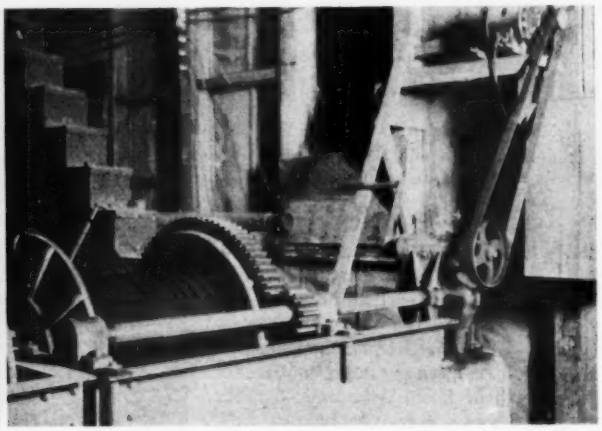
It is the hornblende andesite that is important economically in the Bodie section, for it is in this formation that all of the quartz veins are found. The ore shoots opened up in the Southern Consolidated mines all have a strike very similar to the general strike of the batholith. It is not to be understood that the extent of the batholith is meted by the contact with the basic lava andesite flow for the hornblende andesite probably stood up as a mountain when these flows occurred and the contacts between the two are probably unconformable.

### TYPE OF DEPOSITS

The deposits at Bodie belong to a group, in Lindgren's classification, which have been deposited in late tertiary time, at shallow depths below the surface by hot solutions, as distinguished from veins of moderate depth like the mother lode veins or contact metamorphic deposits of deep-seated origin.

During the late tertiary epoch orogenic disturbances followed the intrusions; the whole cordilleran region was lifted high above the sea level, warped, and faulted, and the middle and close of the tertiary





witnessed outflows of lavas upon a magnificent scale.

These eruptions spread over large areas of the western part of the continent; they are abundantly reported in California, Washington, Idaho, Colorado, Utah, Nevada, New Mexico, Arizona, and attain their greatest development in Mexico.

Andesites and rhyolites are the predominating rocks. These deposits were often of great richness, which is further accentuated by secondary processes; in fact, most of the "bonanzas" belong to this class.

Veins of mines of this type are poor in minerals other than gold and silver, but usually contain some argentite, pyrargytite, tetrahedrite and pyrite.

Among the gangue minerals quartz prevails but in most cases it is associated with much adularia; calcite and flourite are also common, but barite is rare.

Representative districts, besides Bodie in California, are Tonopah, Goldfield, the Comstock, Tuscarora in Nevada, the Black Mountains in Arizona, Jarbidge and DeLamar in Idaho, the San Juan and Cripple Creek in Colorado; Pachuca, El Oro, and Guanajuato in Mexico.

The deposits range in size from small veins and masses such as some of the ore ledges of Goldfield, Nev., to enormous bodies of quartz and ore such as make up the Comstock Lode.

It is well known that many of the deposits in the areas mentioned have been mined to depths in excess of 3,000 ft., so that we may expect at Bodie that these ore bodies will be found at considerable depth.

### The Veins and Ore Bodies

The veins which have a strike of north 10 to 30 degrees west and a prevailing easterly dip are of two periods of mineralization.

In the older vein system the vein filling is an iron-stained quartz with some calcite, while the younger veins carry a larger proportion of calcite. Later than both vein systems was a very pronounced faulting. Most of this faulting is in general parallel to the veins, but cross faults of considerable movement have cut the ore bodies.

On Bodie or Standard Hill most of the ore bodies which were of great length and of good width up to 90 ft. were found after penetating 50 to 200 ft. of volcanic breccia. It is then that the ore-bearing andesites were reached. It is due to the breccia, along with the detrital material, that few of the Bodie veins outcrop on the surface.

The ores of Standard Hill, at the north end of camp, were very generally free milling and a high percentage (95 percent) of saving was made by amalgamation followed by cyanidation.

The ores of the Oro and Addenda mines of the Southern Consolidated group are of the rich ruby antimonial silver sulphides; gray copper ore tetrahedrite, chalcopyrite and pyrite in a quartz gangue which they were unable to concentrate and ship at a profit in 1880. Flotation will make a very high-grade concentrate which can be shipped today at a handsome profit.

The Old Gold Mining Company of Los Angeles took possession of the Southern Consolidated group of mines, consisting of the Red Cloud, Noonday, Oro, Addenda and Maybelle properties, early in January of this year. A camp was established on January 30 and the property was rehabilitated and the equipment added.

The unwatering of the Red Cloud shaft of the Southern Consolidated Mining Company was under the management of R. A. Welch, superintendent of the property, and myself.

The equipment consists of a 75-hp. double drum, Fairbanks-Morse electric hoist; a 17 x 10½ x 14-in. Ingersoll Rand compressor, equipped with a 150-hp. motor, and three specially designed hand-operated worm-gear-driven hoists with drums to handle 4,500 ft. of ⅝ cable.

These specially designed hoists were built by the Joshua Hendy Iron Works, of San Francisco, and to Mr. Collins, of their engineering staff, must be given the credit for their development.

The Red Cloud shaft, through which the unwatering of these properties was undertaken, is a three-compartment shaft, with two hoisting compartments, each 5 x 5 ft., and a pump compartment, which is 5 x 7 ft.

The shaft was in fairly good condition for having stood since 1882 without any repairs or having been used in any great measure for operating purposes. One of the strangest things about a shaft of this size was that there were no hanger bolts and there were no bearer sets. This shaft was rehabilitated to 412 ft., the level of the water at the time.

The pumping equipment consists of two Byron Jackson six-stage 2½ x 14-in. centrifugal pumps, direct connected to 200-hp. motor, with a guaranteed capacity of 550 gallons each from the 750-ft. level. One of these pumps was a horizontal pump fitted with a special thrust bearing and placed on a frame or cage to be lowered in the pump compartment, and the second pump is their vertical unit. This vertical pump was to be lowered through one of the working or cage compartments. The horizontal pump set at an angle of about 45 degrees on the cage which was to be used for lowering.

It is the plan to unwater the property to a depth of 700 ft. and place this horizontal pump as a station pump at this level. The vertical unit will be used as a stand-by unit and as a sinker when it is found advisable to unwater the shaft to the 900-ft. level, the bottom.

This is probably the first time in the history of metal mining that oil-well equipment has been used to advantage in unwatering. (*Continued on page* 926)

# *The* APPLICATION *of* CAVING METHODS *to* SMALL ORE BODIES *at* OLD DOMINION

*By* A. H. SHOEMAKER*

MINES of the type of the Old Dominion have an increasingly difficult task to make a profit with increasing depth. The grade of ore is lower when the oxidized and enriched zones have been bottomed and the greater proportion of mining is in the zone of primary sulphides.

Hoisting, pumping, ventilation and development costs are increased at greater depths. This, coupled with the decrease in grade, makes it imperative that some major cost be reduced sufficiently to permit profitable operation.

The only possible relief under such circumstances is a cheaper mining method. No other operation is susceptible of sufficient reduction to afford this margin.

It is for this reason that the Old Dominion has in large part adapted a caving method to small ore bodies.

The success of the method evolved here leads us to believe that caving methods have a much wider application than has been held by most mining men, and that an account of the system as used at the Old Dominion may be of value to others confronted with a similar problem.

The close cooperation of the engineering, geological, and operating departments is responsible for the successful adaptation of this caving system. Geological information is necessary before a preliminary layout can be made, and close engineering control is essential underground. The changes made since the first experimental stope was started have been decided in frequent conferences of all departments concerned.

The Old Dominion vein is a true fissure vein, varying in dip from 45° to 90°, and in width from 2 ft. to about 65 ft.

The dip in the areas caved is from 60° to 75°. The maximum width caved is 60 ft.

The footwall side of the vein is generally quartzite or limestone replaced by sulphides. The hangingwall is usually highly altered diabase with a high pyrite content. In one area the whole width of the vein consists of heavy granular pyrite with some chalcopyrite.

On the hangingwall side there is generally a considerable width of altered diabase with low-grade copper values.

This brief description of the vein shows that generally there is no uniform hardness of ground, even within the limits of one particular stope.

* Geologist, Old Dominion Company.

*CAVING Methods Have Wider Application Than Is Generally Supposed—Close Cooperation Of Engineering, Geological And Operating Departments Essential To Success—System, Which Is A Modification Of Morenci Inclined Slide Caving Plan, Fully Outlined*

The system used is a modification of the Morenci inclined slide caving plan. The timbering and the interval between slides have been taken over unchanged. The development of caving by the use of timbered inclined slides was made at the Morenci branch of the Phelps Dodge Corporation. Old Dominion has taken their system and adapted it to ore bodies of a different type.

In a general way, the plan is to run a timbered pony drift on the footwall of the vein. From this drift timbered slides at 35° are run to the hangingwall at 20-ft. centers. A shrinkage stope is then run on the footwall. Then from the crosscut slides the remainder of the block is undercut and drawn. (Figure 1.)

The changes made in experimenting with a new system of mining are of as much value to the outsider as to the local men. Hence a brief discussion of the changes made since starting will bring out several significant details of operation.

At first slides were run on the footwall each way from a central raise. Then cross slides were run from these (Figure 2.) This has several disadvantages. It places the cross slides at different elevations so that the draw from the lower slides may cause the collapse of the upper slides. The installation of the brow set for the start of the cross slide is complicated. The handling of supplies always on the incline is very inconvenient. In a case where there is no ore below the level to mine, a large tonnage is left on the sill floor below the peaks of the slides, which must be handled by a more expensive method or, if the grade does not justify a greater mining cost, that ore is lost.

To obviate these difficulties the slides on the footwall were eliminated, and in their place a flat pony drift was driven on the footwall with crosscut slides from this flat drift. The raise interval had to be decreased from 60 to 40 ft. Slots at 45° from the raise to the start of the cross slides permits the uninterrupted flow of ore.

This layout does away entirely with the objection of drawing from slides at different elevations, and permits easy timbering of the brow set for the cross slide. It brings the handling of supplies on the incline down to a minimum, and materially reduces the tonnage left on the sill floor.

The vertical height caved is usually 50 ft. This distance is taken because experience shows that with a greater distance than this where the vein is between 60° and 70° ore is lost on the footwall side. This is an extremely important factor at the Old Dominion, because the footwall side of the vein is usually much higher grade than the hangingwall side.

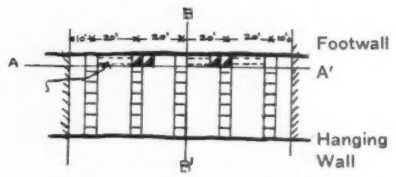
The using of 50 ft. as the maximum vertical height to be caved makes it necessary to make one installation from an intermediate level. The intermediate installation is the same as on the sill floor, with the exception that on the sill the pony drift must be placed up one floor in order to dump into cars.

The details of timbering are shown in Figure 3. Instead of round-back lagging and split lagging for the sides, 4 in. by 6 in. timber is used; 4 in. by 6 in. spacing blocks are used to keep the lagging at the proper interval. This 4-in. interval is an important detail. This permits the drilling and blasting of boulders which are throwing weight on a set. No set should ever be tight lagged.

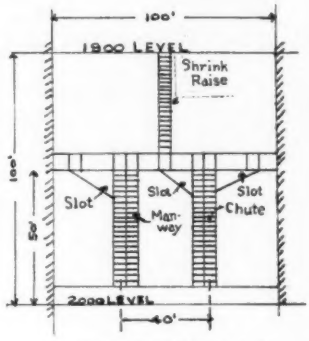
Beginning with the first set beyond the brow, set controls are placed in every other set. From these sets draw holes or small raw raises at about 45° are driven apexing midway between the slides. Occasionally controls are placed in every set, but every other set remains a "blind" set.

These controls are made by nailing two cleats on each post at about 45° to the angle of the post and placing a 2 in. by 12 in. between them. The lower control is about 18 in. from the bottom of the slide. Two such controls are placed in each drawing set.

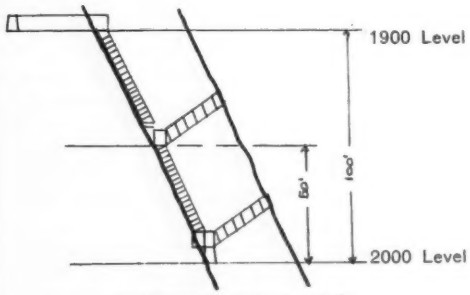
After the installation of the pony drift and the starting of the slides the shrinkage stope can be started. It is not neces-




PLAN—UPPER INSTALLATION



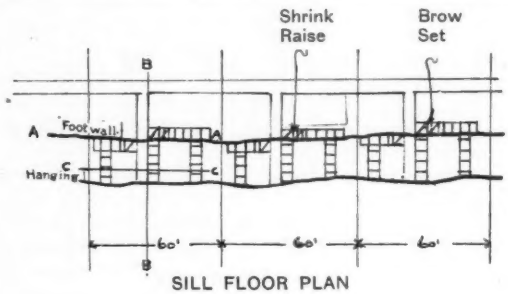

SECTION THROUGH A-A'



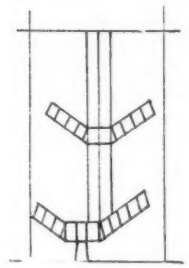

SECTION THROUGH B-B'

Figure 1

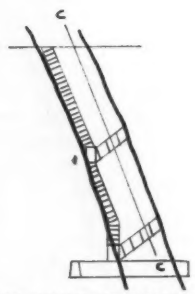
TYPICAL CAVING STOPE
OLD DOMINION COMPANY



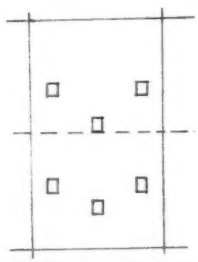

SILL FLOOR PLAN



SECTION THROUGH
A-A




SECTION THROUGH
B-B



SECTION THROUGH
C-C

Showing difference in elevation of crosscut slides. Draw from central slide may collapse others on side.

Figure 2

ORIGINAL CAVING PLAN
OLD DOMINION COMPANY

sary that the cross slides be completed. They need be driven only beyond the limits of the shrink so that they can be attacked later without having to go through broken muck. This is an attractive feature of the system, because the development of the block does not need to be completed before production can be had.

The size of the shrink is a separate problem for each stope. If the footwall side of the vein is hard the shrink should be broken wide. If it is soft it must be kept as small as possible because of safety. The object of the shrink is to cut loose completely the ore from the footwall so that recovery from the high-grade side of the vein will be complete.

After the shrinkage stope has been completed undercutting starts. The first operation is to cut the draw holes. After that a cut is taken over the top of the incline. The draw holes are then connected across between slides. The blasting of pillars starts from the footwall side and progresses to the hangingwall.

Before a pillar is shot down the draw holes must be connected across from the next slide. This then gives an opportunity to come in from under good ground to observe the effect of the blast. It is possible in many cases to get back in and drill the pillar a second time. This would be impossible except by having a safe entrance so that the back can be barred down in the clear.

A portion of a pillar must not be blasted separately. A section half way between the slides and over the incline must be taken as a unit. This is a precaution to prevent excessive weight from being thrown on the slides.

As a safety factor in undercutting no holes may be drilled beyond a vertical line separating two pillars. This is to prevent drilling into missed holes.

The initial cut over the top of the incline is important. Without it the timbers would be crushed by direct weight when the pillars are set down. There should be room enough to accommodate the swell from the initial slough. Rapid draw can then ease any weight on the timbers.

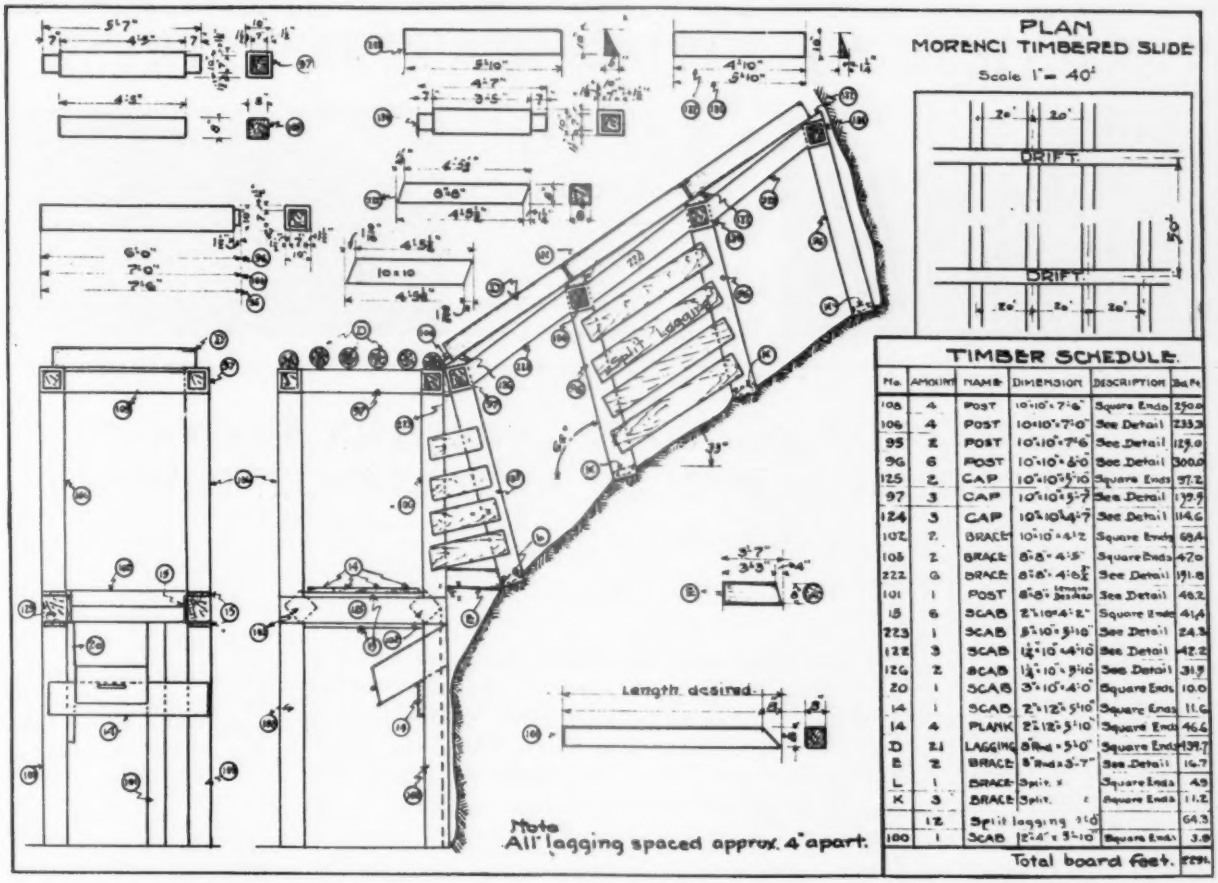
The drawing when the stope is on an inclined vein must start from the footwall side and be limited to that side for some time in order to get the hangingwall waste to follow on top the ore. The draw holes next to the hangingwall have less ore to draw than those on the footwall. If the hangingwall is drawn too early waste will come through and cut off high-grade ore on the footwall. The proportionate draw between footwall and hangingwall depends on the total tonnage and dip of vein. Hence, where there is a varying width and dip between two stopes they require different treatment.

Below is given the timber and powder cost and labor efficiency of square setting and top slicing as compared with caving.*

| | Timber Bd. ft. per ton | Tons per man shift | Powder Cents per ton |
|---|---|---|---|
| Square set.. | 14.0 | 4.7 | 8 |
| Top slice.... | 12.0 | 10.9 | 7 |
| Caving .... | 2.6 | 19.8 | 4 |

*Average for eight months, 1928.

The factors governing the applicability of caving are dilution and the amount of copper lost in the operation as compared to a selective method. If the same amount of copper is recovered by caving




TIMBER SCHEDULE

| No. | Amount | Name | Dimension | Description | Bd. Ft. |
|---|---|---|---|---|---|
| 108 | 4 | POST | 10"×10"×7'6" | Square Ends | 250.0 |
| 106 | 4 | POST | 10"×10"×7'0" | See Detail | 233.3 |
| 95 | 2 | POST | 10"×10"×7'6" | See Detail | 125.0 |
| 96 | 6 | POST | 10"×10"×8'0" | See Detail | 300.0 |
| 125 | 2 | CAP | 10"×10"×5'10" | Square Ends | 97.2 |
| 97 | 3 | CAP | 10"×10"×5'7" | See Detail | 139.9 |
| 124 | 3 | CAP | 10"×10"×4'7" | See Detail | 114.6 |
| 102 | 2 | BRACE | 10"×10"×4'2" | Square Ends | 69.4 |
| 105 | 2 | BRACE | 8"×8"×4'5" | Square Ends | 47.0 |
| 222 | 6 | BRACE | 8"×8"×4'6½" | See Detail | 191.8 |
| 101 | 1 | POST | 8"×8"×[illegible] | See Detail | 46.2 |
| 15 | 6 | SCAB | 2"×10"×4'2" | Square Ends | 41.4 |
| 223 | 1 | SCAB | 3"×10"×3'10" | See Detail | 24.3 |
| 122 | 3 | SCAB | 1½"×10"×4'10" | See Detail | 42.2 |
| 126 | 2 | SCAB | 1½"×10"×3'10" | See Detail | 31.9 |
| 20 | 1 | SCAB | 3"×10"×4'0" | Square Ends | 10.0 |
| 14 | 1 | SCAB | 2"×12"×5'10" | Square Ends | 11.6 |
| 14 | 4 | PLANK | 2"×12"×5'10" | Square Ends | 46.6 |
| D | 21 | LAGGING | 8"Rnd.×5'0" | Square Ends | 139.7 |
| E | 2 | BRACE | 8"Rnd.×5'7" | See Detail | 16.7 |
| L | 1 | BRACE | Split, x | Square Ends | 4.9 |
| K | 3 | BRACE | Split, | Square Ends | 11.2 |
| | 12 | Split lagging 3"×6" | | | 64.3 |
| 100 | 1 | SCAB | 2"×4"×5'10" | Square Ends | 3.8 |
| | | | | Total board feet. | 2294 |

*Figure 3. Standard timbering of Morenci timbered slide used by Phelps Dodge Corp., and adopted by Old Dominion.*

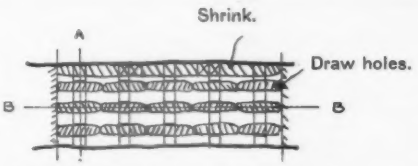
as by a selective method, then a large percentage of dilution is permissible.

At the Old Dominion the low grade on the hangingwall side of the vein makes it possible in most instances to recover as many pounds of copper by caving as by square setting or top slicing.

When the original expectancy has been reached from a caving stope, drawing can continue as long as the grade is sufficient to pay for the labor of draw, tramming, hoisting and treatment. The cost of development and general mine expense are not chargeable against overdraw.

Whenever there is a loss of copper by caving instead of some selective method, then the applicability of the system is greatly limited.

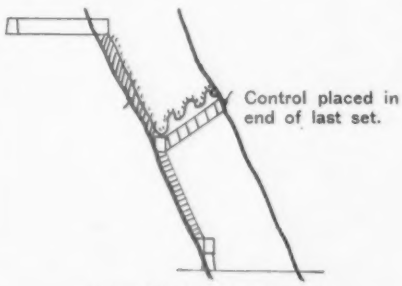
Another important feature of caving by means of inclined slides is its flexibility. If unforeseen conditions are met in the development of a block of ore, the installation as originally planned can be added to. For example, in the horizon of the Mescal limestone bedded ore is often found. If it is in the footwall slides are run into the foot from the pony drift, and that ore is mined before undercutting the main block. If it is in the hangingwall an extension of the crosscut slides beyond the hangingwall gives a means of ore disposal.



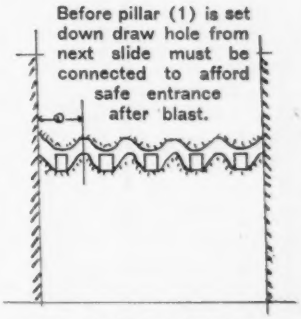

OPERATIONS OF UNDERCUTTING

1. Shrink on footwall.
2. Cut draw holes.
3. Cut over top of inclines.
4. Set down pillars.

Undercut and drawing can start from east end of stope before completion of development to the west.




SECTION THROUGH A-A
Showing stope after completion of shrink, draw holes and cut over incline. Ready to set down pillars.




SECTION THROUGH B-B
Showing connection of draw holes.

Figure 4

DETAILS OF UNDERCUTTING TYPICAL CAVING STOPE OLD DOMINION COMPANY

# PRACTICAL OPERATING MEN'S DEPARTMENT

# COAL

NEWELL G. ALFORD
*Editor*

***Practical Operating Problems of the Coal Mining Industry***

## *A* CORRELATION *of the* COALS *of* WESTERN KENTUCKY, SOUTHEASTERN ILLINOIS *and* SOUTHWESTERN INDIANA

*By* WILLARD ROUSE JILLSON, SC. D.*

***First Correlation Of These Coal Seams Made In 1854 Was Based On Outcrop Observation And Is Still The Standard Of Present Comparisons — Subsequent Prospecting By Drilling Has Given Much Additional Data—Correlation Here Presented Is Based On Study Of Most Recent Information***

ALTHOUGH geological investigations of the coals of that part of the Central Interior coal field of the United States closely adjacent to the Ohio River have been in progress since about the middle of the last century, not a little uncertainty still exists with respect to a correlation of the various interstate members. The outstanding difficulties at the present time are those which might logically be expected as the direct outgrowth of intermittent investigations carried forward by independent though official surveys of the three states involved: Illinois, Indiana, and Kentucky. The first careful work in this area was done and published[1] by Dr. David Dale Owen, state geologist of Kentucky, in 1854. His observations and correlations were almost all based upon outcrop examinations. So accurately was this investigation carried out that it still remains the standard of comparison for that basal part of the coal measures which it involves.

Within recent years a number of core drillings have been completed in this part of the Ohio Valley, and with the release of these actual rock sections, some of which have been carefully studied by competent men, rather full information has been made available for use in stratigraphic comparison. In Illinois a core has been drilled near New Haven, in Gallatin County, to a depth of 2,242.5 ft., and this record has fortunately been made ready for public use in an official document of that state.[2] In the adjoining state of Indiana a somewhat shallower but very important core was drilled to a depth of 1,030.1 ft. near Mt. Vernon, in Posey County. The casing head elevation of this well was 405 ft. and the entire record is set out in a recent publication[3] of the In-

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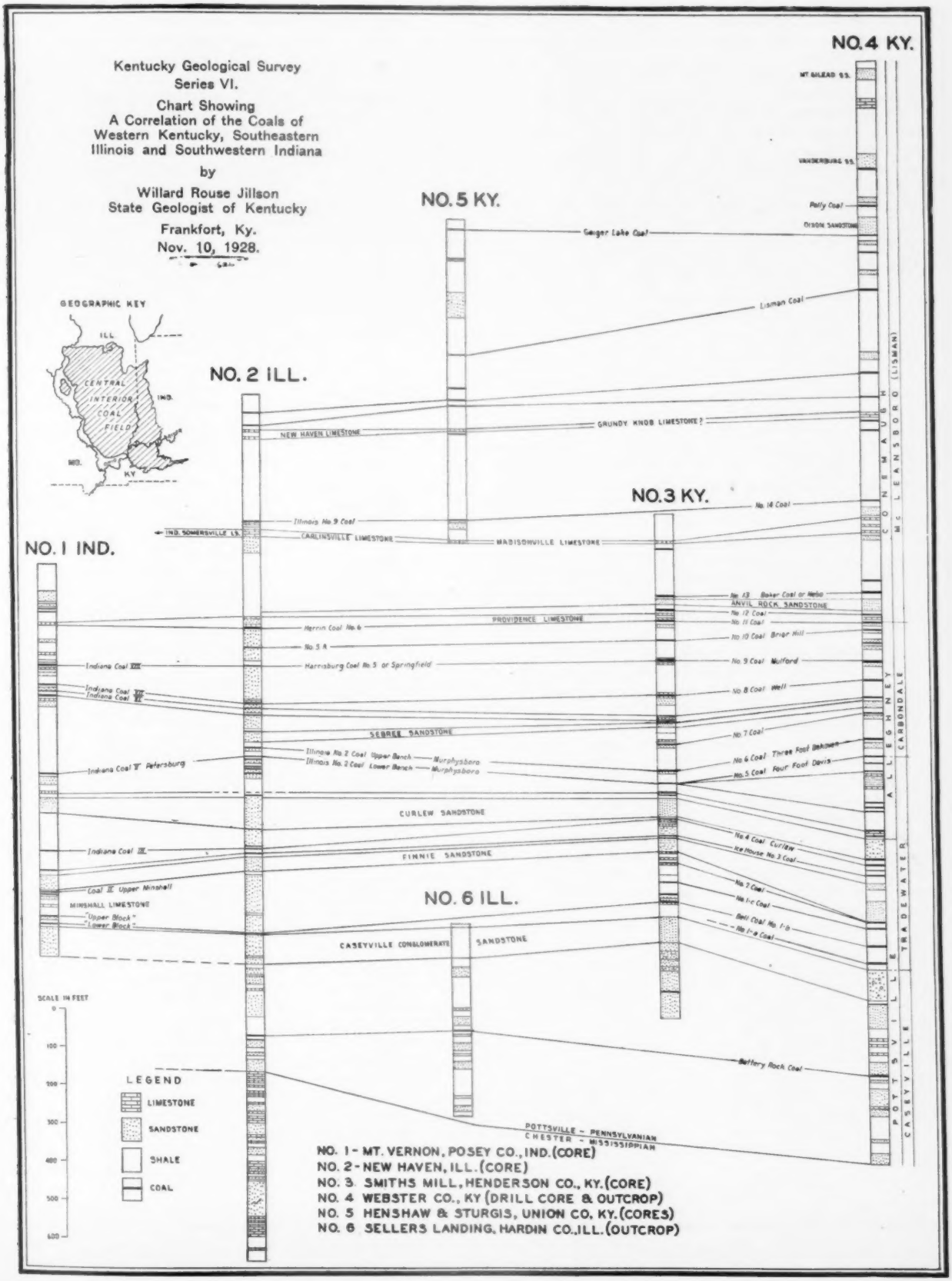
* State Geologist of Kentucky.

[1] Kentucky Geological Survey, Vol 1, 185.

[2] Illinois Geol. Survey, Bull. 19, Coal Resources of District V, by G. H. Cady, Plate II, Log. No. 8, 1919.

[3] Ind. Geol. Survey, Pub. No. 65, Geology of the Deep Wells of Indiana, by W. N. Logan, pp. 474-75, 1926.


Kentucky Geological Survey
Series VI.
Chart Showing
A Correlation of the Coals of
Western Kentucky, Southeastern
Illinois and Southwestern Indiana
by
Willard Rouse Jillson
State Geologist of Kentucky
Frankfort, Ky.
Nov. 10, 1928.
GEOGRAPHIC KEY
ILL.
CENTRAL INTERIOR COAL FIELD
IND.
KY.
NO. 1 IND.
NO. 2 ILL.
NO. 5 KY.
NO. 3 KY.
NO. 4 KY.
NO. 6 ILL.
Geiger Lake Coal
Liman Coal
NEW HAVEN LIMESTONE
GRUNDY KNOB LIMESTONE?
IND. SOMERSVILLE LS.
Illinois No. 9 Coal
CARLINSVILLE LIMESTONE
MADISONVILLE LIMESTONE
No. 14 Coal
No. 13 Baker Coal or Nebo
ANVIL ROCK SANDSTONE
No. 12 Coal
No. 11 Coal
No. 10 Coal Brier Hill
No. 9 Coal Mulford
No. 8 Coal Weir
No. 7 Coal
No. 6 Coal Three Foot Block
No. 5 Coal Four Foot Davis
No. 4 Coal Curlew
Ice House No. 3 Coal
No. 2 Coal
No. 1-c Coal
Bell Coal No. 1-b
No. 1-a Coal
Battery Rock Coal
PROVIDENCE LIMESTONE
Herrin Coal No. 6
No. 5 A
Harrisburg Coal No. 5 or Springfield
Indiana Coal VIII
Indiana Coal VII
Indiana Coal VI
SEBREE SANDSTONE
Illinois No. 2 Coal Upper Bench — Murphysboro
Illinois No. 2 Coal Lower Bench — Murphysboro
Indiana Coal V Petersburg
CURLEW SANDSTONE
Indiana Coal III
FINNIE SANDSTONE
Coal II Upper Minshall
MINSHALL LIMESTONE
"Upper Block"
"Lower Block"
CASEYVILLE CONGLOMERATE
SANDSTONE
POTTSVILLE – PENNSYLVANIAN
CHESTER – MISSISSIPPIAN
MT. GILEAD SS.
VANDERBURG SS.
Petty Coal
ORSON SANDSTONE
CONEMAUGH
McLEANSBORO (LISMAN)
ALLEGHNEY
CARBONDALE
TRADEWATER
POTTSVILLE
CASEYVILLE
SCALE IN FEET
0
100
200
300
400
500
600
LEGEND
LIMESTONE
SANDSTONE
SHALE
COAL
NO. 1 - MT. VERNON, POSEY CO., IND. (CORE)
NO. 2 - NEW HAVEN, ILL. (CORE)
NO. 3. SMITHS MILL, HENDERSON CO., KY. (CORE)
NO. 4 WEBSTER CO., KY (DRILL CORE & OUTCROP)
NO. 5 HENSHAW & STURGIS, UNION CO. KY. (CORES)
NO. 6 SELLERS LANDING, HARDIN CO., ILL. (OUTCROP)

diana Geological Survey. Kentucky, fortunately, has had several strategically located cores drilled, particularly in the vicinity of the towns of Henshaw and Sturgis, Union County, and at Smith's Mill, in Henderson County. The Union County records have also been published in a report on the Shawneetown Quadrangle,[4] and the Henderson County log has been presented on a new structural map[5] of this area, which is shortly to be followed by a detailed geologic report now in press. Besides these items, a very important generalized section of Webster County, together with a detailed report, has been published by the Kentucky Survey.[6] In addition to these specific references there are a number of published reports[7] on this region which present much of value.

In attempting a solution of the problem of the correlation of the coals found in the territory centering about the junction of the Wabash and the Ohio Rivers, some use has been made of all publications referenced as pertaining to this field. A layout in chart form of the Mt. Vernon core, New Haven core, Smith's Mill core, the Webster County general section, the selected Union County cores, and the Sellers Landing outcrops has been prepared. With a unit scale for all of these cores and sections it is readily apparent that correlations are possible in both a broad and specific way for this territory. The outstanding rock formations of regional significance begin with the Caseyville conglomeratic sandstone, at the top of Caseyville formation in the Pottsville group. In ascending order, the Finnie sandstone occurs about the middle of the Tradewater formation (upper Pottsville) in the Smith's Mill, Ky., section. Above it, at the top of the Pottsville, is found the Curlew sandstone, definitely recognizable in Indiana, Illinois, and Kentucky.

Somewhat higher in the section, in the middle of the Allegheny group and the lower part of the Carbondale, occurs the Sebree sandstone, recognizable in Illinois and Kentucky but passing into a shale above the Petersburg coal in southwestern Indiana. Still higher and close to the base of the McLeansboro formation, immediately above the Kentucky No. 11 coal, the Herrin, or No. 6 of Illinois, occurs the Providence limestone, recognizable in Indiana, Illinois, and Kentucky. This is one of the most definite and positive blanketing formations in the field. Shortly above this calcareous member occurs the Anvil Rock sandstone of type locality in Union County, also recognizable in Webster County, but passing northward into a shale in Indiana and Illinois at the mouth of the Wabash River.

About 250 ft. above the base of the Conemaugh, the Illinois section shows the well-defined Carlinsville limestone, a correlative of the Kentucky-Madisonville limestone, found about 75 ft. below the surface in the Smith's Mill core in Henderson County. It is probably the same as the Somerville limestone of Indiana. Occurring about 600 ft. above the base of the Conemaugh (Herrin) coal in Illinois section, the New Haven limestone finds a correlative in what may be the Grundy Knob limestone of Union County. An eastward extension in Webster County occurs about 650 ft. above the Kentucky No. 9 coal. Besides these formations, there are in all of these cores and localities many prominent sandstones, some locally very significant but without definite value, it appears, for broad purposes of regional correlation.

In the tentative correlation of the coals of this district which this paper presents the writer indicates the No. 6 coal of Illinois, underlying the Providence limestone, to be the No. 11 coal of Kentucky. Of this there is no doubt. About 100 ft. lower in the section the Indiana No. 8 coal is correlated with the Illinois (Harrisburg) No. 5 or Springfield coal and the Kentucky No. 9, Mulford coal. On this basis the Indiana No. 7 coal becomes the Kentucky No. 8 or Well coal; and the Indiana No. 5, Petersburg coal, becomes the Illinois lower bench No. 2, or "Murphysboro" coal, the same as the Kentucky No. 5, Four Foot or Davis coal. The lower block coal of Indiana is correlated with the Bell coal or No. 1, "B," of the Kentucky section in Union and Webster Counties. Lower in the section, the Battery rock coal is found to continue northward from the Tradewater region of Kentucky into Gallatin County, Illinois, but in that locality, being deep, thin and of poor quality, is not definitely named.

A comparison of the cores and sections presented for Indiana, Illinois, and Kentucky indicates rather clearly increased sedimentation in Kentucky throughout the Pottsville and Allegheny epochs, as compared to the Illinois and Indiana sediments of the same time. Not only is this true but the Kentucky section, besides being more lengthy, exhibits a larger number of coals, both thick and thin seams being considered in comparison. Indiana shows a larger number of coals in the Pottsville group but less in the Allegheny. The Kentucky section is rich in shales, some of which are thick bedded, and all of which are rather thoroughly intercallated between limestones, sandstones, and coals. The Illinois section is predominantly sandy, with the usual Conglomeratic members. In the Indiana section a rich development of shales is indicated, beginning at the top of the Finnie sandstone and continuing up to within a few feet of the Indiana coal No. 6. Only the central portion of this division is given over to two sandstones, one of which is a correlative of the Curlew, a thin limestone and the Indiana No. 5 or Petersburg coal.

In presenting this correlation specific attention should probably be called to the fact that the top of the Curlew sandstone is designated as top of the Pottsville, it now being indicated as a result of paleobotanical investigations that the Illinois No. 2 coal, Lower Bench, formerly indicated as the probable top of the Pottsville in both Illinois and Kentucky reports, is in fact more closely related to the overlying Allegheny than the Pottsville division. Another fact of importance brought out in this correlation is the still unsolved problem as to the correlation of the coals in the Kentucky Tradewater formation with those of Illinois and Indiana. It is suggested that the Kentucky No. 4 coal may be the Indiana No. 3, but lack of assurance attends this proposal, although both of these coals occur between two perfectly definite granular clastics, the Finnie sandstone and the Curlew sandstone above it. Another difficulty is seen in extending the Anvil Rock sandstone northward beyond the well-known type locality at Anvil Rock in Union County, Kentucky, to the New Haven and Mt. Vernon areas. It would appear, since records in those localities show no massive sandstones closely above the No. 12 coal and underlying the Providence limestone, that the Anvil Rock is certainly a lenticular formation highly developed in thickness along the Ohio River in its type in Kentucky and Illinois locality, but replaced to the north by shales.

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Utah's coal output for 1927, according to official figures now available, show a total of 4,781,480 tons, which brought a revenue of $11,084,000, an average price per ton of $2.32. A total of 3,339 miners worked 209 days, producing about 6.84 tons of coal per man per day. Of the total coal produced, 32,940 tons were consumed at the mines for steam and heat and 142,184 tons were turned into coke at the mines.

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[4] Ky. Geol. Survey, Series IV, Vol. IV, Part II, Geology of the Shawneetown Quadrangle in Kentucky, by Wallace Lee; pp. 41-42 and 15-16-17, 1916.

[5] Ky. Geol. Survey, Series VI, Structural Map of Henderson County, Ky., by C. V. Theis, 1927.

[6] Ky. Geol. Survey, Series VI, Geology and Coals of Webster County, Ky., and structural map of Webster County, by L. C. Glenn, Series VI, Vol. V, 1921.

[7] Ky. Geol. Survey, Series III, Bull. 17, Coals of the Tradewater River Region, by L. C. Glenn, 1912.

U. S. Geol. Survey, Ditney Folio No. 84, M. L. Fuller and G. H. Ashley (Indiana), 1902.

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Indiana Geol. Survey, Handbook of Indiana Geology, 1922.

Ill. Geol. Survey, Bull. No. 20, Geology and Mineral Resources of the Springfield Quadrangle, Urbana, 1915.

Ill. Geol. Survey, Bull. No. 47, Geology and Mineral Resources of the Equality-Shawneetown Area, by Charles Butts, 1925.

Ill. Geol. Survey, Mining Bull. 15, Coal Resources of District VI, Urbana, 1916.

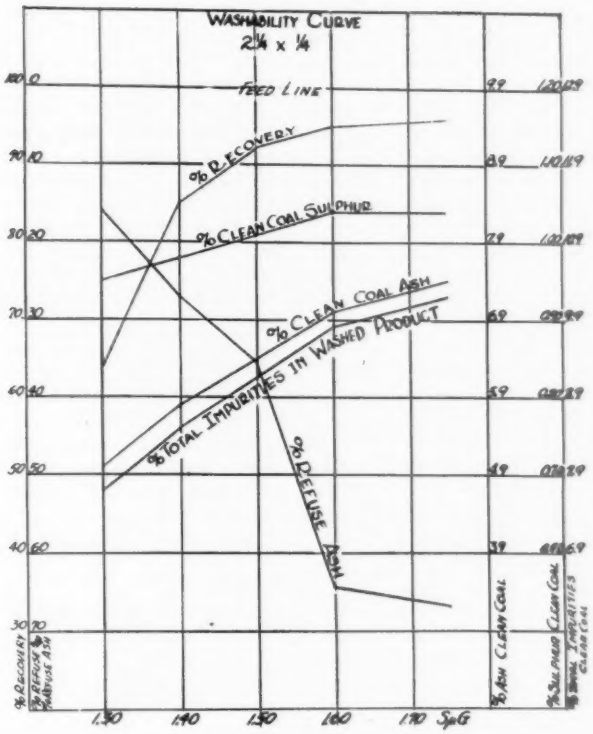


Figure 1

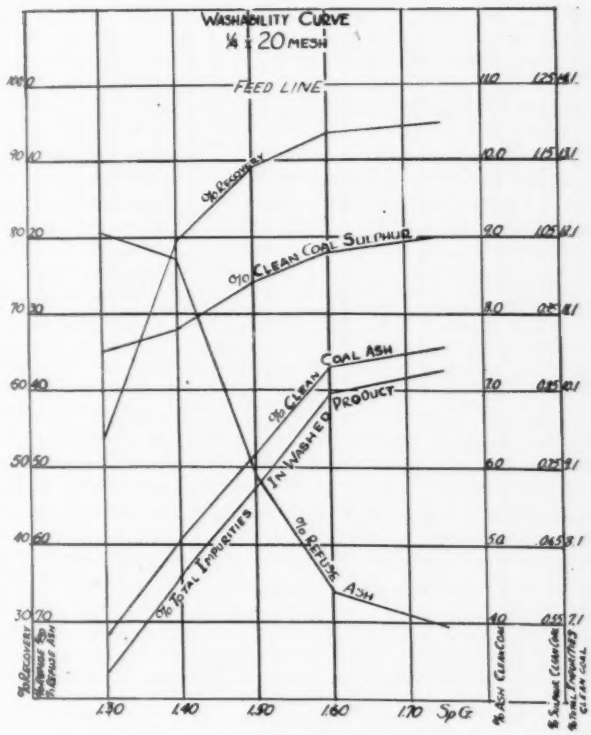


Figure 2

# RELATIONS *of* FLOAT *and* SINK TESTS *to* PRACTICAL COAL WASHING

***THIS Article Presents A Graphic Method Of Compiling Laboratory Float And Sink Data Into Terms Of Practical Coal Washing, That Can Be Readily Understood By The Layman, As Well As The Washability Expert***

*By* A. H. COLE *

IT is frequently necessary for an executive having only a superficial knowledge of coal washing to make the final decision as to the advisability of installing coal-washing equipment, and, to some extent, what must be expected of a plant already in operation to meet particular market conditions. The graphic form presented here is offered as a simplified method of compiling laboratory float and sink data and converting them into terms of practical coal washing that can be readily understood by the layman as well as the washability expert.

It should be understood, however, that a graph of this type shows what could be expected of a plant operating at 100 percent efficiency. In other words, the difference between the results shown here and the results obtained from plant operation constitutes the efficiency of the plant.

Figures 1 and 2 represent two sizes of coal from the same mine. Examination of these reveals that the basis used for construction is, first, that the top of the graph represents raw or feed coal, thus placing all factors in direct relation to the feed. Second, the ratio of clean coal ash to both percent recovery and percent refuse ash is as 10 to 1, and the ratio of clean coal sulphur to clean coal ash is also 10 to 1, thus giving all factors the prominence due with regard to their importance. Further inspection reveals that the curve for recovery of clean coal should approach as closely as possible the feed line, thus assuring the minimum bank loss; i. e., loss as refuse. The remaining curves should, on the other hand, recede as far as possible from the feed line to insure maximum reduction in ash and sulphur. Thus the ideal figure would be one in which the curve for recovery of clean coal would be a horizontal line approaching as closely as possible to the feed line, while the remaining three curves take a position as far as possible from the feed line, and, as with the curve for recovery of clean coal, remain horizontal. This is, of course, impossible, due to the banded material having gravities intermediate to the two end points. That the unexpected may always be expected from these so-called "middlings" is clearly brought out in the figures given.

The curve showing total impurities; i. e., ash, sulphur, and moisture (assumed in this case to be 1.80 percent); is introduced to bring out the consumers' point of view by indicating the effective B. t. u. which may be expected in the clean coal. It should be noted that the B. t. u. content of any particular coal is in almost direct inverse proportion to the total impurities present; i. e., for every percent decrease in the total impurities in the coal shown here there is an increase of approximately 150 B. t. u. Therefore, if adequate information is available regarding the coal in question, a curve might well be inserted showing this effective B. t. u. This has not been

*Associated with Pittsburgh Coal Company, Research Department.

done in this case, as it is felt that it would add to the difficulty of reaching a clear understanding of the figures.

A slight study of these figures brings out the following facts with respect to this particular coal:

From examination of the curve for sulphur in clean coal it is evident that washing to remove sulphur would be impractical. There is not sufficient reduction in sulphur at any gravity to warrant the expense of washing.

Examination of the curve for percent of ash in clean coal and the curve for percent recovery of clean coal would indicate that by cleaning at a 1.75 gravity a material reduction in ash could be made with a high percentage of recovery, or, in other words, little loss of tonnage to the refuse pit. An additional reduction in ash of about one-half of 1 percent may be expected with less than one-half of 1 percent additional loss to refuse by washing at a gravity of 1.60. Market conditions would, of course, determine at what gravity the plant should operate.

Further study reveals that a high-grade metallurgical fuel could be produced by dual cleaning; i. e., cleaning at 1.30 gravity and recleaning the refuse from this process at 1.60. Thus the material below 1.30 or, roughly, 58 percent of the feed, would provide excellent metallurgical fuel, while the material between 1.30 and 1.60 would produce a steam coal slightly higher in ash than that in the feed, as indicatd by the sharpness in the rise of the clean coal ash curve between these points. The advisability of operating the plant on this basis would, therefore, depend as much or more on the ability to dispose of the low-grade steam coal as on the market for metallurgical fuel.

In closing, it must be understood that a graphic form of this type, or indeed any type, can never tell the entire story. Certain factors not directly related to the test conditions used in the compilation of float and sink data are of paramount importance and should be noted in the final report along with the graphic data. I wish to call special attention to some of the more important of these. The most obvious single factor is, of course, the increase in price obtainable for reduction of ash and increase in effective B. t. u. A factor not so readily seen is that of "stabilization," by which I mean reduction in variation of impurities from car to car. It is my experience that consumers will frequently pay a heavy premium for the assurance of a source of supply of consistent quality, even though the actual reduction in impurities be very slight. Another factor having an important bearing on washability is the possibility of reducing the cost of mining by mechanization. There are many mines in this country where either mechanical mining or coal washing is impossible independently, while by incorporation of the two, the cost of mining is reduced and the quality of the product is improved to the point where a salable product is produced, and at a cost well within market limitations. It is also reasonable to assume that by the use of mechanical devices underground operating in conjunction with the cleaning plant on the surface a considerable amount of coal may be salvaged which would otherwise be classed as unsalable and would, therefore, be left underground in such condition that any subsequent effort to remove it would be impossible. The amount of coal lost to posterity in this manner is by no means a minor item. Still another fact of no slight importance is that of increased tonnage through proper preparation. The mining industry is notorious for the small number of working days per year. If by coal cleaning the tonnage can be increased, and therefore the number of working days per year increased, it is evident that there must be a considerable reduction in overhead, labor turnover, etc., and therefore a considerable reduction in cost per ton of coal produced.

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**COMMITTEE on MECHANIZED MINING**
(*From page* 906)

tensive cooperative study offers to assist the companies with which they are affiliated, and the industry at large, through their cooperation. The coal-mining industry is changing from hand to machine methods, and nothing can so assist this transition as the widespread knowledge of effective methods and equipment successfully employed under the varied conditions encountered.

The first organization meeting of the committee is to be held Friday afternoon, December 7, at the Mayflower Hotel, Washington, D. C. This date has been chosen because it comes during the Thirty-first Annual Convention of The American Mining Congress, and many of the committee members will be in Washington attending the sessions of the convention. At that meeting the details of form and content of reports from district representatives will be decided upon together with other important phases of the committee's procedure.

Much of the information obtained through this cooperative study will be printed in the pages of this JOURNAL, and the reports of the committee's mechanization engineer, Mr. G. B. Southward, will continue to appear. This feature of the study, so closely followed by operators and engineers in the past, is to take on even greater significance as the work of the committee gets under way.

Individuals and companies who are cooperating are to receive frequent reports from the Washington office advising them of important improvements just as soon as effected. These improvements in mechanical mining, whether accomplished by changed methods of cutting and shearing, drilling and blasting, loading, transportation or cleaning, are of vital significance to the subject as a whole, and will be treated in the reports in the light of their relation to the entire subject. As stated in the earlier announcement of the organization, the purpose of the National Committee on Mechanized Mining is "to promote efficiency, economy and safety in the production of coal."

That the support of the leading companies and engineers throughout the United States in this tremendous undertaking will have a profound effect toward benefiting the condition of the industry as a whole is assured.

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**STRIPPING ON MESABA RANGE**
(*From page* 908)

three miles, and in the establishment of the latter to a height of from 30 to 35 ft. (which is preferable) a mud sill trestle is constructed with 12 to 15-ft. centers.

The area to be filled, as a rule, is either a sixteenth, an eighth, or a quarter section, and the location of the trestle is usually diagonally across the area to be filled. The advantage of this is that after the trestle is filled it is double tracked and with each throw of the track from either side it automatically shortens, making it unnecessary to crib up the end, thus avoiding an expensive operation. In many cases, in order to dispose of all of the material on the area provided, it is necessary to construct a second trestle on top of the first dump, and operate it in the same manner as cited above.

Where the surface of the area to be filled is soft, it is necessary to use pile trestles, sometimes driven to a depth of 20 to 30 ft. Even then, unless the greatest care is used, it is liable to push out, causing expensive delays. We have been fooled on one or two occasions when sounding proposed dump areas and encountering supposedly hard bottom, to have it later develop, to our sorrow, that it was a strata of hard material underlaid with soft material. In such cases it is a common practice to dump the material and sluice it into place.

Wet pits are sometimes encountered, we having had two such outstanding experiences. In one case the overburden was approximately 80 ft. deep. We encountered water at the 20-ft. level and handled from then on approximately 2,000 gallons per minute until the job was completed, during which time we handled 500,000 (*Continued on page* 926)

# PHYSICAL EXAMINATION *in* BITUMINOUS COAL MINING

***Physical Examination of Employes Should Become A Standardized Practice In Coal Mining —Results Obtained In One District Outlined, And Possibilities If Made Universal Presented***

*By* GEORGE FORDHAM*

THE coal industry differs from many other industries, in that the living quarters are located near the point of mining. Many of these locations do not make ideal town sites; yet, if money is available for development, very comfortable quarters can be made for the new-born town. Isolation from contact with the outside world is rather the rule, and each community must be a separate unit unto itself. In some cases it is a distinct advantage, and in others it is more or less of a handicap. In many cases it is an important factor in the labor turnover. Hence, if a town can be made attractive to the miner and his family, it adds a great deal to his contentment, since discontented labor is not as productive.

In the planning of a town more attention should be given to the physical comforts of employes than has been done in the past, as the best class of labor will not work at any given place unless they can enjoy the comforts of life. At the same time they have an assurance and an actual picture before them that their health and the health of their family will not be jeopardized by the industry or its living conditions, and the price of good, healthy living conditions is a constant one. Because an attractive town is built, does not mean it will remain that way, except by constant care on the part of the management.

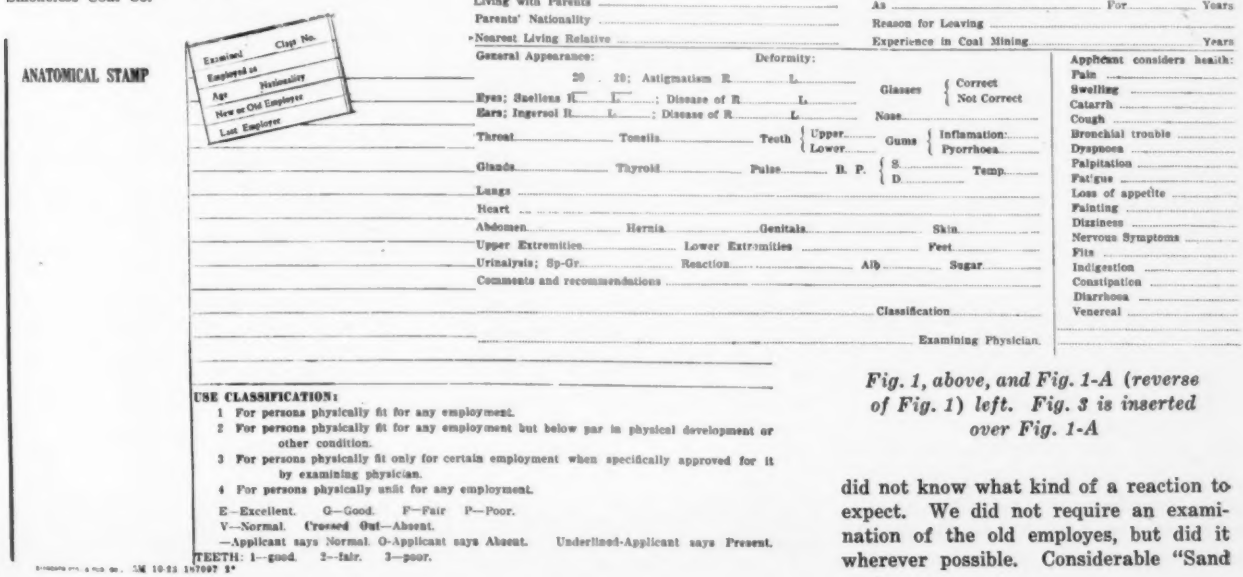
One of the outstanding features of a happy and contented home is a healthy family, and in this I think we should start early in the training of health work, develop a constructive program and keep everlastingly at it. Much time is lost by sickness, and here a constructive "health program" can be aided by a competent nurse. In most instances the children will carry the health work to the father and mother, rather than the reverse. Many will ask, "What has a sick baby to do with the mining of coal?" If the sickness can be prevented, the family group are functioning in a normal way. Let the sickness come along and the miner is prone to stay home and help care for the baby. Then and there is a slip in the production chart.

It is here that we should start our physical examination or, rather, it should be started in pre-natal work, so that we would have reason to expect a well and normal child. Then a little way along the road we stop for a "baby clinic"; if defects are found, an attempt should be made to have them corrected. The next step is the examination of school children, more correction if need be, and soon we have the applicant ready for work. If the above had been carried out, we have reason to assume that he will arrive at a working age in a good physical condition.

After going over these matters, and trying to plan how best to safeguard the health and well-being of the mining town, we, at Wyco, W. Va., decided to put into effect a physical examination of all applicants for employment. In January, 1922, physical examination was put in effect, while in February, 1924, the morbidity records were started; at the same time starting a graph to check on the loading performance per man per day.

This being a new adventure for bituminous coal mining in this section, we did not know what kind of a reaction to expect. We did not require an examination of the old employes, but did it wherever possible. Considerable "Sand

* PH. G., M. D., C.P.H. Medical Adviser, Gulf Smokeless Coal Co.


PHYSICAL EXAMINATION AT ..... W. Va., on ..... 192..

Name ..... Age ..... Yrs., Wgt. ..... Lbs., Hgt. ..... Ft. ..... In.

For Employment As ..... Nationality .....

Born on ..... At ..... New ....., Present ....., or Former Employe .....

Male ..... Female ..... Married ..... Single ..... Formerly Employed From ..... To .....

Residence of Family ..... As .....

No. of Children ..... Ages ..... Last Employer .....

Living with Parents ..... As ..... For ..... Years

Parents' Nationality ..... Reason for Leaving .....

Nearest Living Relative ..... Experience in Coal Mining ..... Years

General Appearance: Deformity:

20 / 20; Astigmatism R. ..... L. .....

Eyes; Strabismus R. ..... L. ..... ; Disease of R. ..... L. ..... Glasses { Correct / Not Correct

Ears; Impaired R. ..... L. ..... ; Disease of R. ..... L. ..... Nose .....

Throat ..... Tonsils ..... Teeth { Upper ..... / Lower ..... Gums { Inflamation: ..... / Pyorrhoea .....

Glands ..... Thyroid ..... Pulse ..... B. P. { S. ..... / D. ..... Temp. .....

Lungs .....

Heart .....

Abdomen ..... Hernia ..... Genitals ..... Skin .....

Upper Extremities ..... Lower Extremities ..... Feet .....

Urinalysis; Sp-Gr. ..... Reaction ..... Alb. ..... Sugar .....

Comments and recommendations .....

Classification .....

Examining Physician .....

Applicant considers health:
Pain .....
Swelling .....
Catarrh .....
Cough .....
Bronchial trouble .....
Dyspnoea .....
Palpitation .....
Fatigue .....
Loss of appetite .....
Fainting .....
Dizziness .....
Nervous Symptoms .....
Fits .....
Indigestion .....
Constipation .....
Diarrhoea .....
Venereal .....

ANATOMICAL STAMP

Examined ..... Clap No. .....
Employed as .....
Age ..... Nationality .....
New or Old Employe .....
Last Employer .....

USE CLASSIFICATION:
1 For persons physically fit for any employment.
2 For persons physically fit for any employment but below par in physical development or other condition.
3 For persons physically fit only for certain employment when specifically approved for it by examining physician.
4 For persons physically unfit for any employment.

E—Excellent. G—Good. F—Fair P—Poor.
V—Normal. Crossed Out—Absent.
—Applicant says Normal. O-Applicant says Absent. Underlined-Applicant says Present.
TEETH: 1—good. 2—fair. 3—poor.

*Fig. 1, above, and Fig. 1-A (reverse of Fig. 1) left. Fig. 3 is inserted over Fig. 1-A*

ORDER FOR PHYSICAL EXAMINATION, ..... W. Va.,.....

Please examine bearer .....

For Employment as .....

Age is.....years on..... Nationality.....

New....., present....., or former employe.....

Date formerly employed ..... to..... as.....

Last employer .....

Was working as ..... for.....years

Reason for Leaving .....

No. Years Experience in Coal Mining ..... Yrs..... Mo.

CLASSIFICATION..... REMARKS.....

.....

.....Superintendent.

.....Examining Physician.

1-2-3-4. No.....on.....Payroll. .....Clerk.

*Fig. 2*

Mr..... Mine Foreman.

Please employ the bearer, whose name appears on reverse side,

As .....

with wage rate of $..... per day, $.....Car.

.....

Superintendent.

Acknowledged:

.....

Mine Foreman.

.....

Timekeeper.

*Fig. 2-A (Reverse of Fig. 2)*

house" talk made the rounds, but, as a whole, we have met with only two cases of flat refusal in the past six years. Now the physical examination is being welcomed by the men as a whole.

To make a routine examination, and at the same time have a permanent record, we decided on the physical examination card (see Figs. 1 and 1-A). So far it has proven very satisfactory. In addition to this, we have a card for the use of the superintendent or the general manager that contains the essential facts that he wants for ready reference (see Figs. 2 and 2-A). Then, on the pay-roll sheets we have a form printed that aids the pay-roll clerk, who is not allowed to issue scrip or money to a new employe unless he has been examined and his record card returned with the results of his examination. In this way we can keep a check on all new employes (see Fig. 3). In going over the physical examination blanks (1 and 1-A) we use three different colors for the three general classes of labor, which simplifies the filing:

White card for native-born white.

Blue card for native-born colored.

Salmon-colored card for foreign born.

In making physical examinations a large number of physical defects are encountered, many that can be corrected, some which can not be corrected and yet not be a bar to employment. I believe that if only men were taken who were free from defects the production would be no greater than where men are placed according to the general physical condition found at the time of examination. Here the results may differ, as hardly any two will interpret minor physical defects as the same.

Table No. I shows the nature of physical defects and pathological conditions most frequently encountered among the men examined for employment by the company from February 1, 1924, to May 31, 1927:

TABLE I

| Physical defects and pathological conditions (listed in order of their frequency as recorded in the physical examination records) | Number of men having specified physical defects | Percent with specified physical defect |
|---|---|---|
| 1. Defective teeth | 428 | 75.1 |
| 2. Enlarged tonsils | 226 | 39.6 |
| 3. Pyorrhea | 145 | 25.5 |
| 4. Flat feet | 140 | 24.6 |
| 5. Enlarged inguinal rings | 91 | 16.0 |
| 6. Heart defects, including murmur | 37 | 6.5 |
| 7. Defects or pathological condition of lungs | 18 | 3.2 |
| 8. Venereal disease | 14 | 2.5 |

Number of men examined in that time 570.

Defective teeth was the defect most frequently found. Out of the 570 men examined 428, or 75 percent, had defective teeth. The third most frequent defect or condition was pyorrhea. Enlarged tonsils were found to be the second most frequent defect encountered.

Comparison of these results with the results of the other persons conducting physical examinations should be made with extreme caution, due to the tendency of individual examiners to look for certain conditions and overlook many conditions which another examiner might record. Nevertheless, where the differences are extremely wide, the results may be significant. For comparative purposes there is available the findings of the U. S. Public Health Service in examining 10,000 male industrial workers in 10 different industries. The frequency of defective teeth appears to differ greatly in the bituminous coal group examined compared with the 10,000 men examined by the Public Health Service as shown below.

Table II shows the comparative frequency of defective teeth found in a group of bituminous coal workers and among 10,000 male industrial workers by age and for certain nationalities:

The group of bituminous coal workers, it is seen from the above table, had about 2½ times as many persons with defective teeth, per 100 examined, as among the 10,000 industrial workers examined by the Public Health Service. In the latter group it was found that defective teeth showed little variation from industry to industry, hence the high rate for the bituminous coal group is rather surprising, and seemingly indicates the special need for oral hygiene and dental attention in the soft coal fields of West Virginia. The relation between defective teeth and race is an interesting one, but the data were not adequate in the present instance for such an analysis.

In the venereal diseases this figure is far too low. We are the only company doing physical examination in this section. Men in the younger age group come here for employment and find a physical examination as a prerequisite; they will not take the examination, but wander along to a mine where physical examination is not required. If this is true in venereal diseases, so it is in the other physical defects, especially in rupture, etc.

This coal field being located about midway between the larger industrial sec-

TABLE II

| Age group | All nationalities | | American white | | American colored | |
|---|---|---|---|---|---|---|
| | Group of bitmuinous coal workers | 10,000 male industrial workers | Group of bituminous coal workers | 10,000 male industrial workers | Group of bituminous coal workers | 10,000 male industrial workers |
| | Rate per 100 examined | | | | | |
| Under 30 years of age | 64 | 24 | 70 | 26 | 64 | 24 |
| 30-39 years | 71 | 31 | 63 | 31 | 85 | 40 |
| 40 and over | 67 | 45 | 61 | 47 | 55 | 58 |

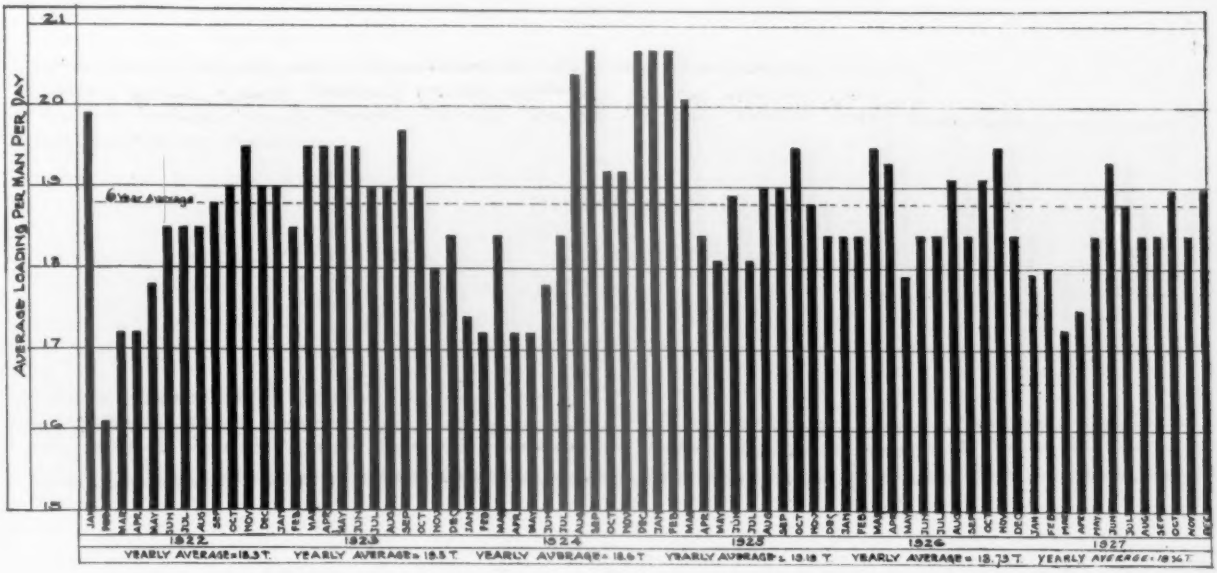



*Fig. 4*

tions of the North and South, it gets the labor as it migrates between the two industrial centers.

As to the labor turnover, the following explains itself: During the period of the study, February 1, 1924, to May 31, 1927, the exits totaled 618. The equivalent number of persons under observation for one year were 660, which divided into 618 gives an annual rate of labor turnover of 93.6 percent. Stated in another way, there were nearly 200 quits per year in a labor force averaging approximately 200, making the rate of labor turnover slightly less than 100 percent a year. Of course, some men quit more than once during the period of the study. The distribution, according to times quit, was as follows:

| | |
|---|---|
| Number of men who did not quit during the study | 147 |
| Number of men who quit and did not return during study | 390 |
| Number of men who did quit once but returned during study | 36 |
| Number of men who quit twice during study | 71 |
| Number of men who quit three times during study | 14 |
| Number of men who quit four times during study | 2 |

One often hears it said that, with physical examination, "What can you do with the rejected ones?" For a coal company, with a fair number of employes, the ones with defects can be placed outside or properly placed inside, where they can do the required task and still not be a burden to their more fortunate relatives or the taxpayer. On the other hand, the ones with defective hearing, rupture, or active venereal diseases, should not be permitted inside the mines, especially in the low-vein mines, and those, with other conditions, such as defective vision, which endanger themselves or their fellow worker, should be barred.

In looking back over a period of six years that we have had physical examination in effect, I can not see any reasonable objection, other than that some cripples applied here for work and, discovering our requirements, went on. If each mine or industry could and would utilize their own cripples, how much better it would be for all concerned.

The enclosed graph marked an actual record of the loading performance of the coal loaders in our mines. Day workers are not included. While it has variations, yet the six-year average is 18.8 tons per man and it brings out many interesting facts. Just why February, 1922, should be such a low month, we are unable to offer any explanation. The dip, starting in November, 1923, and extending to January, 1924, was due to a change in the inside foreman, with the general labor unrest following. Since that date the same inside foreman has been in charge. From December, 1926, to May, 1927, the mine operated full time. Starting about May 1, the run was about three to four days per week and the improved and constant tonnage is noticeable.

The base line of this graph was placed at 15 for convenience, and at first glance it would seem that there was a far greater variation than when you are looking at the graph from 1 on up to 21.

In conclusion, the physical examination at the time of employment and semi-annually or annually thereafter is the real foundation of health work in industry. As only by having a healthy unit can we hope to have a healthy industry, and, after all, health is the *all*, no matter what one's vocation in life may be.

The coal-mining industry is overcoming handicaps and coming to the front in welfare and industrial medicine, and one can look confidently to the future and see a physical examination for all employes on a form that is standardized by the industry.

If the various compensation commissions look upon a man as being 100 percent perfect at the time of an injury, can not the industry standardize the examination so that we may know what each and every man's condition is before the injury at the time of his employment in the industry.

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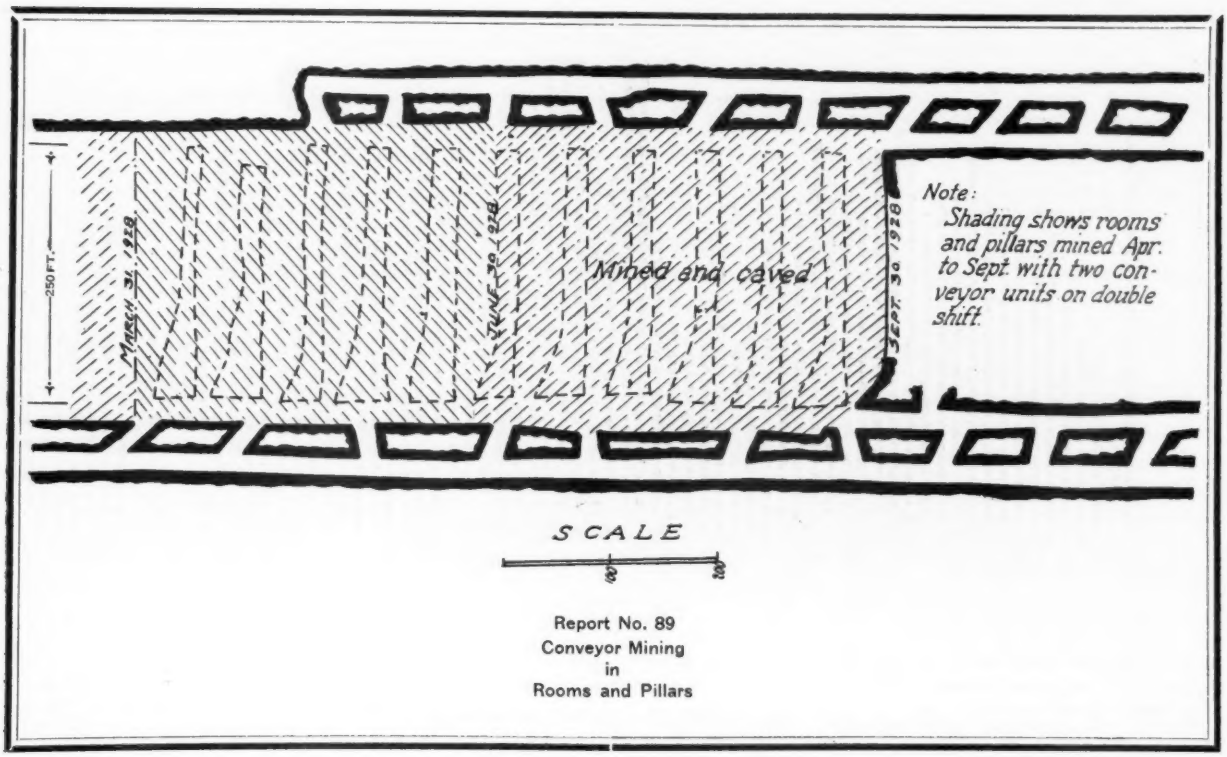
Director Klein, of the Bureau of Foreign and Domestic Commerce, in his annual report states that the mineral division of the bureau will shortly issue a commercial survey of mineral raw materials in the principal countries of the world, a coal exporters manual, and a report on the international trade in petroleum. Considerable assistance is rendered by the division to American exporters of copper, lead, zinc and coal, in the form of statistical and industrial reports covering activities abroad, in addition to special studies undertaken as occasion requires.

Figures are given showing the number of workers required to produce articles exported from the United States. It requires 26,000 persons to mine the coal we sell to others, 24,000 persons to manufacture iron and steel entering world markets, 12,000 in petroleum refineries and many others in producing crude oil for export, and 7,000 persons in copper smelters and many more in the mines to furnish copper in the export trade.




# MECHANIZATION REPORT NO. 89

*By* G. B. SOUTHWARD

MECHANIZATION Report No. 89 describes a room and pillar operation with conveyor mining in a seam 3 ft. 8 in. in height. The mine was operated with hand loading for a number of years in a section of the property where the seam was of greater thickness than in the present conveyor workings. In part of this property the seam was less than 4 ft. in height and it was considered by the management that the low coal could not be mined on a competitive basis with the thicker coal if the same mining methods were used. About two years ago an experimental conveyor installation was made. This operated for some time during which several mining methods were tried, but about a year ago the room and pillar system now in use was decided to be the most suitable for the conditions here existing.

All hand loading is now discontinued in this mine and at present three conveyor units are operating. Two of these are in rooms and pillars and the third one has recently been installed to drive the entries. All of these are now working on double shift and the mine is producing an average of approximately 300 tons per day. Each room operation will mine slightly over 50 tons per shift and the entry operation will be slightly less than 50 tons.

## CONVEYOR MINING IN ROOMS AND PILLARS

The map submitted with this report shows the mining that was done with two conveyor operations working double shift during the six months' period of April-September, 1928. In this panel the entries were developed with hand loading into mine cars and the rooms and pillars were mined retreating as shown. Under the present plan two conveyor units are operated at one time in a panel. These work adjoining rooms and the operations are scheduled so that while one operation is recovering a pillar the other one is driving the next room ahead.

With this system two mine car loading points are required on the haulageway and since the rooms are driven on 70-ft. centers there is only 70 ft. of car storage room between the two loading points. This arrangement does not cause interference in the car movement at the two loading points as long as the two operations are synchronized and loading at approximately the same rate. However, there are times when the operation of one unit does cause some inconvenience and delay to the other one, and the management is now considering the advisability of having only one conveyor operation working in one panel. The present method is shown in Figure 2.

Figure 2 also shows a comparison between the conveyor system and that used with hand loading into mine cars. The purpose of this comparison is to illustrate the mining areas required to produce the same tonnage per shift by each of the two methods. At this mine there is at present no hand work being done under similar conditions to those existing in the conveyor workings since the conveyors were installed where the seam was unsuitable for hand loading. Consequently the comparison which is made in Figure 2 is to some extent theoretical as it is based on the actual conveyor performance and the assumed performance which would be had if hand loading were used.

Two conveyor units usually produce about 100 tons per working shift loading about two cuts each in rooms 40 ft. wide with 20-ft. pillars. In hand mining it is assumed that the rooms would be driven approximately 20 ft. wide and that over extended periods of operation the average loading rate would be to clean up two-room cuts in three days. On this basis the territory required for a production of 100 tons per day would be as shown in the sketch.

The present operation is considered satisfactory by the management but no direct comparison with mine car loading can be made because of the difference in conditions existing where the two methods are used. The operation so far has demonstrated the practicability of successfully mining a seam that is too low for economical operation of the mine cars. By reason of a more simplified haulage and the concentrated working area the conveyer operation in the low coal is competing satisfactorily with the mine car loading in higher coal and under more favorable working conditions.

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## OPERATING REPORT

### Physical Conditions

The seam has an average height of 3 ft. 8 in., including a 4-in. bone strata at the top which comes down with the coal. Immediately above the bone there is a fairly hard, thin strata of slate which stands fairly well, but when this is broken the rock above is difficult to hold. Consequently bottom is usually taken for height along the entries. The cover varies from less than 100 ft. to 700 ft. Open lights are used; the entries are rock dusted and the coal is sprinkled at the face. As a further dust preventative a small stream of water is turned into the water-trough.

### Mining System

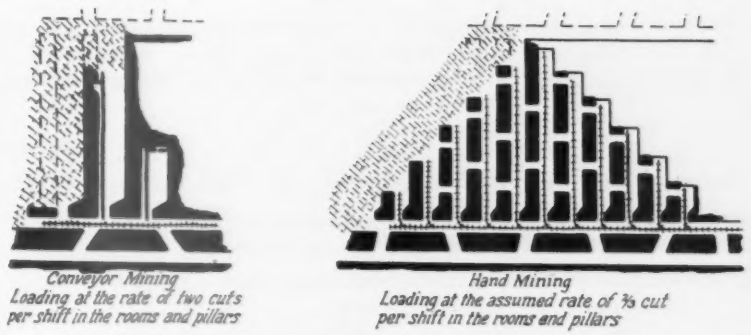
The mining system used is the room and pillar method modified to suit conveyor operation. Entries, rooms and pillars are mined with conveyors. The rooms are 40 ft. wide and are driven 250 ft. long, leaving a 20-ft. pillar. As soon as a room is driven up the pillar is started back, working open end until the first roof fall occurs. From this point on the recovery is by cross cuts and pockets.

Two rooms are at present worked at one time in a panel and while one pillar is being recovered the next room ahead is being advanced. The work is carried on double shift and all operations from the cutting to the loading are performed continuously during each shift.

### Cutting, Drilling and Blasting

Coal is machine undercut to a depth of 6 ft., drilled with an electric hand drill and shot with permissible explosives with electric firing. Five shots are usually made for each room cut and three shots are used for a cut on the pillar recovery.

The cutting, drilling and shooting is done by the regular loading crew after a cut has been cleaned up. Shots are fired during the working shift and the smoke is cleared by an electric blower set on the entry with flexible tubing to the face.



*Conveyor Mining*
*Loading at the rate of two cuts per shift in the rooms and pillars*

*Hand Mining*
*Loading at the assumed rate of ⅗ cut per shift in the rooms and pillars*

*Sketch showing a two room conveyor operation and a theoretical comparison of the working territory for producing an equivalent tonnage per shift with hand mining*

*Figure 2*

### Loading

The regular crew for each room has five men.

All coal is hand shoveled on to the face conveyors by four men while the fifth is at the mine car loading point. After a face is loaded out two men do the cutting while the others drill timber and extend the conveyor. The usual performance in the room advancement is to clean up two cuts per shift or four cuts per day; on the pillar recovery this same rate is generally averaged, but because of the fact that the pillars are narrow the daily tonnage is less than in the room advancement.

### Haulage

No track is laid in the rooms. The haulageway along the entry is laid with 25-lb. steel on 44-in. gage. A side track is usually located fairly close to the working rooms and mine cars of 2½-ton capacity are delivered in trips to the conveyor discharge point. Usually five cars are placed at one time and these are dropped past the loading point by hand. One gathering locomotive with crew of two men serves two adjoining conveyor operations as well as the third unit driving entries.

### Timbering and Pillar Recovery

A row of posts is set with each cut during the room advancement and the pillar recovery. These vary from 6 to 8 in. in diameter and are set about 5 ft. apart. No timbers are recovered, and during the pillar retreat the posts are left in until crushed by the roof weight.

A high percentage of coal recovery is reported by the management. The room pillar is mined with conveyor as far down as a small stump along the haulageway, which is recovered by hand mining. The chain pillars when recovered are mined by extending the room conveyors across the air course from the next panel below.

### Summary of Operating Crew

The two conveyor operations have a crew of five men each employed for all the regular operations from the face to the gathering locomotive. Some extra work is required periodically to move and reset the conveyors to the new location ahead when a pillar is completely mined out. The men employed for track and general operation and maintenance are not a part of the conveyor crews but all inside labor and the proper proportion of all surface labor is included by the management in their figures for determining the economic success of their conveyor mining.

### Production Records

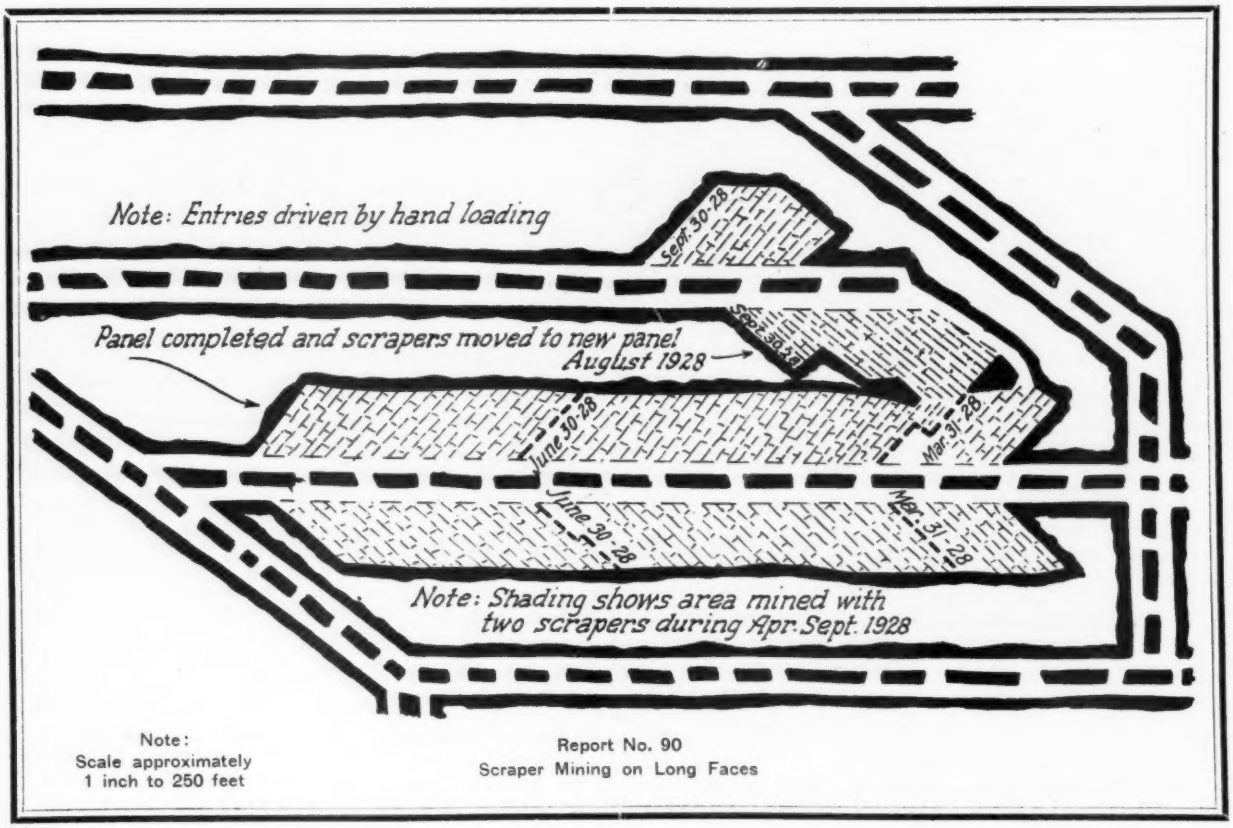
The production record on the 25th of October, 1928, showed a tonnage of 5,981 tons for the month. This was made by three conveyor units—two on rooms and pillars and one on entry advancement. All operations worked double shift and this makes an average of approximately 300 tons per day. This average is based on full working time and does not take into account any delays which might have occurred during that period.

### Equipment

Each conveyor operation used 250 ft. of haulage conveyor and two portable face conveyors. All units are of the drag chain type with separate electric drives. In addition to the conveyor there is also one cutting machine, one ventilator blower and tube, one electric hand drill with each operation and one gathering locomotive for three operations.

### Preparation

The coal is picked to some extent by the loaders at the working face, but picking tables are used on the tipple to insure clean preparation. The management reports that a slightly increased amount of slate is had over hand mining but the size of the coal compares favorably with that produced by mine car work.


Note: Entries driven by hand loading
Sept. 30-28
Panel completed and scrapers moved to new panel
August 1928
June 30-28
Mar. 31-28
June 30-28
Mar. 31-28
Note: Shading shows area mined with two scrapers during Apr.-Sept. 1928

Note:
Scale approximately
1 inch to 250 feet

Report No. 90
Scraper Mining on Long Faces

# MECHANIZATION REPORT NO. 90

*By* G. B. SOUTHWARD

## SCRAPER MINING ON LONG FACES

MECHANIZATION Report No. 90 describes a scraper operation on long faces working in a seam of coal slightly over 3½ ft. in height. This mine has been worked for a number of years with hand loading into mine cars and about three years ago an experimental scraper operation was installed. During the first year of operation the scrapers were used in several different mining systems including long straight faces, but about one year ago the present method was decided by the management as being the one best suited for the conditions existing at this mine. During the past year the daily tonnage has been gradually increased so that the average production is now about 300 tons per day from two scraper units.

The mining system is a modification of a retreating long face method with the faces angling in toward the entries so as to form a V or Y shape mined area. A scraper is dragged along the face and discharges into mine cars which are placed in trips along the haulageway at the end of the face. Figure 1 shows the territory which has been mined by one operation with two scraper units during the six months' period of April to September 30, 1928. This map is a reproduction of the actual mine workings and it not only shows progress but also shows the coal which has been lost or left unmined.

The chain pillars which are not recovered are extremely interesting illustrations of the practicability of using small stumps of coal as a substitute for pack wall in long face work. These pillars are approximately 20 ft. thick and this figures a theoretical loss of coal of from 5 to 7 percent of the total area mined. Actual figures are not available, but from an inspection of the map the actual recovery very closely approximates the theoretical. The roof action during the year that this system has been employed has been very favorable and it is believed by the management that the unmined chain pillars have contributed very largely toward this. The roof falls occur periodically, usually after an advance of from 50 to 100 ft. has been made and generally break at more or less right angles to the line of the entries, leaving the faces and the V-shaped area open.

At the present time the faces are retreating at the average rate of one cut per day. An 8-ft. cutter bar is used and since the cut is made perpendicular to the face, the rate of retreat parallel to the length of the entry is about 12 ft. per day. In order to keep the development work ahead, the entry would require double shifting if only one panel were developed at a time. However, the necessity for double shifting is eliminated by developing several panels simultaneously. This work is done with hand loading into mine cars; the entries are driven wide enough so that the bottom brushing can be gobbed along the chain pillar.

This system affords a high degree of concentration and a comparison with the area required for mining a similar tonnage with hand loading in rooms and pillars is shown in Figure 2. This sketch is to some extent theoretical, but it is based on actual average results by both methods. In this comparison it is assumed that the two scraper faces will be loaded out each day. In the room work it is assumed that two rooms will be loaded out once every three days.

## OPERATING REPORT

### Physical Conditions

The seam has an average height of 3 ft. 8 in. of rather soft structure coal with no regular partings. The top is a sandstone, the bottom is a hard slate and about 2 ft. is taken up on the haulageways. The seam lies fairly level but local rolls of from 10 to 20 percent grade are rather frequently encountered. Cover is as much as 900 ft. but about 400 ft. is the average over the area mined with the scrapers. Closed lights are used, the entries are rock dusted and exhaust steam is introduced into the main air intake.

### Mining System

The mining system is a modified form of long face with scraper loading on the faces and the entries developed by hand. Panels about 300 ft. wide are developed by a pair of entries which are driven to the panel limit before the faces are started. Two faces are worked in each panel turned to the right and left off the entries—each entry has a track and serves as a haulway for the faces on that side. The scraper is dragged along the face where it collects the coal and discharges into mine cars on the haulageway at the end of the faces. The scraper is operated by an electric rope hoist which is set at some distance down the entry so as to obviate frequent moving as the face retreats. The movement of the scraper is controlled by a bell signal from the face.

The faces are angled in toward the entry so as to form a V or Y shaped area. Each face is approximately 160 ft. long and because of the angle it mines a width of slightly over more than 100 ft. The chain pillar is left unmined and serves as a temporary roof support during the mining and tends to localize the roof breaks so that the falls do not come in and close the faces.

Since each of the two faces in the Y have their own haulageway, the operations of one face may be carried on independently of the other. One face clean-up is taken as a usual day's work—this is divided into two shifts with the cutting and timbering on the day shift and the shooting and loading at night.

### Cutting and Shooting

The coal along the faces is undercut with an 8-ft. bar. The shot hole spacing varies according to conditions and frequently a face will break down immediately after an undercut has been made. Permissible explosive is used with electric hand drilling. The cutting is done during the day shift by a crew of two men who cut both faces in a Y. The drilling and shooting is done on the night loading shift—usually only one shot is fired at a time, starting at the end of the face near the loading point and progressing along the face. The drilling and shooting is done by the regular loading crew.

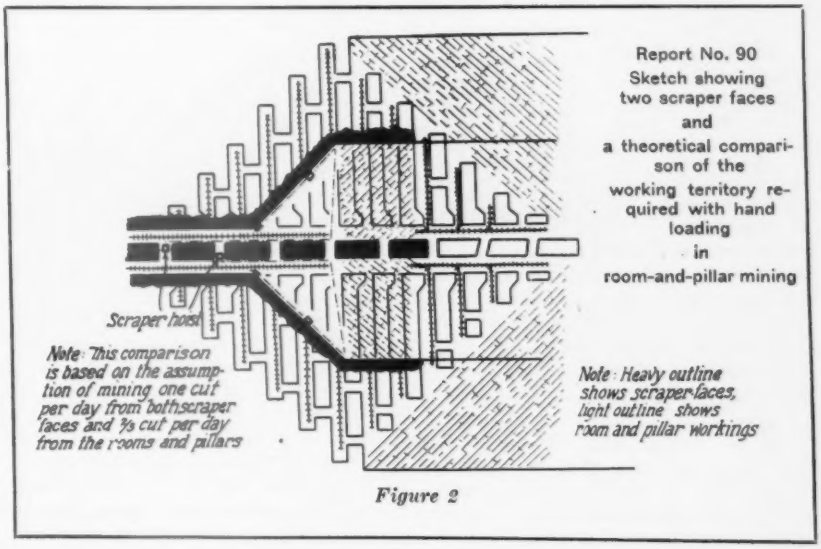

Report No. 90
Sketch showing two scraper faces and a theoretical comparison of the working territory required with hand loading in room-and-pillar mining
Scraper hoist
Note: This comparison is based on the assumption of mining one cut per day from both scraper faces and ⅓ cut per day from the rooms and pillars
Note: Heavy outline shows scraper faces, light outline shows room and pillar workings

*Figure 2*

### Loading

A crew of six men is employed on the night loading shift. Two men work along the face to guide the scraper and break down large lumps or hanging coal. The hoist is operated by one man and a signal man is stationed on the face to control the movement of the scraper.

### Haulage

A gathering locomotive crew of two men serve each scraper operation. The cars are 2¾ tons capacity and are delivered in trips of from 4 to 10 cars and are moved at the scraper discharge by the locomotive. The trip rider acts as car trimmer. The track along the haulway is laid with 25-lb. steel on 44-in. gauge and extends beyond the loading point for empty storage. The length of the trips depends on the storage room from the loading point to the edge of the roof fall.

### Timbering

A row of timbers is set parallel to the face after each cut has been loaded out. This is done by one man who works on the day shift and timbers both faces. The posts vary from 8 to 12 in. in diameter and are set from 8 to 10 ft. apart. The first row is about 10 ft. from the face before the shot is fired.

The roof falls periodically as the mining progresses and usually breaks at right angles to the line of the entries. The falls occur at irregular intervals—at times a face will retreat as much as 100 ft. before the fall occurs. No attempt is made to cause a roof break and the timbers are left in place until crushed by the weight. The falls usually leave most of the face open, but at times a break will come in for as much as 50 or 60 ft. along the back end of the face. This coal is recovered by extending the face on subsequent cuts and the management reports that a high coal recovery is made.

*Summary of Operating Crew Employed on Two Faces*

*Day Crew:*

| | |
|---|---|
| Machine cutters | 2 |
| Timberman | 1 |
| Total men | 3 |

*Night Loading Crew (for one face):*

| | |
|---|---|
| Face men | 2 |
| Hoist operator | 1 |
| Signal man | 1 |
| Motor crew | 2 |
| Total men on each face | 6 |

One foreman supervises both operations, which makes a total of 16 men for the full crew for all regular daily operations.

### Equipment

Each face has one scraper outfit complete with electric hoist, one gathering locomotive, and one electric hand drill. One cutting machine does the work for two faces.

### Production Records

Each face cut produces about 150 tons and an average of one cut per day is now being maintained on each face. This makes a total daily production of about 300 tons for the double unit with two scrapers.

### Preparation

No regular partings occur in the seam and no picking is required except for occasional streaks of impurities which may occur. The management reports that a lower percentage of lump coal is had from the scraper operation than is had in hand loading.

**UNWATERING RED CLOUD SHAFT**
(*From page* 910)

On the surface two long timbers, 14 in. x 18 in., were placed across the pump compartment of the shaft, giving a bearing on either side of the collar. Suspended from these timbers by 1-in. belts are two other timbers of the same size, resting on the second set below the collar of the shaft. On these heavy timbers the spider and slips are placed to hold the two lines of 6¼ oil well casings, which are used for discharge columns. The pumps are lowered and supported from the headframe by a five-part line, using a three and a two way heavy-duty block. Each pump, when fitted with a suction, weighs a little in excess of 5 tons.

The ⅝ hoisting cable is used for the lowering of the pumps and the pipe lines, using the worm-gear driven hand-operated winches. This gives a rope strain of between 4,500 and 5,000 pounds.

Worm-gear-driven winches were decided upon because they are safer, inasmuch as they would not run with a load on. The gear reduction here is 182 to 1.

The horizontal pump, after it was assembled on the cage, was lowered to the 400-ft. level. The vertical unit is handled in the same way on a five-part line by a second worm-gear-driven winch. The third winch, using a six-part line, serves both water columns. The water columns at the 700-ft. level, full of water, will weight 14 tons each.

On the worm-gear-driven winch handling the pipe lines, one handle was removed and a 2½ x 12 in. iron pulley fitted to the shaft. This is operated by a 3-hp. motor for the raising and lowering of the elevators used in lowering the pipe lines.

The 6¼-in. water columns are held in the spider by the slips, and the 20-ft. lengths of casing are added as needed.

Into the upper or discharge end of the casing is screwed an ell with a short nipple. A 6-in. flange is screwed on a nipple in the other end of the ell. Into a 6-in. discharge hose is fitted a short nipple, and on this nipple is screwed a 6-in. flange, which is bolted to the flange on the ell.

An electric cable—a three-way rubber covered, protected cable, heavily waterproofed—was lowered down the shaft on a ⅜-in. pilot cable handled from a small spur-gear-driven winch. At intervals of 25 ft. wood blocks, bolted together, clamp the cable and the pilot cable, leaving no strain on the electric cable.

Between the discharge outlet on the pump and the water column is a 30-ft. length of flexible high-pressure hose. This is screwed into 4-in. high-duty valve, above which, and flanged to it and to the pipe line, is a Smolinsky check valve.

When it is necessary to lower the main column, one man at the winch raises the column out of the slips, which are removed, and he lowers the column to any desired depth when the slips are again placed in the spider and the pipe line comes to rest. When the pipe line reaches the collar of the shaft a short piece of casing, 6 to 8 ft. in length, is screwed into the column and the connection made to the ell and the discharge as described. This allows the collar of the original pipe to be lowered by the elevators to the slips. When it is necessary to add an additional length of pipe to the column, it has been found that the pump can be lowered at least twice, 5 ft. each time, without shutting the pump down, by first lowering the pipe line, then the power cable, followed by the lowering of the pump without stopping. When it is necessary to lower both pumps and add pipe, this can be done by two men in the shaft and three men at the surface, one to handle the winch and two to make the pipe connections. Two pumps and two pipe lines have each been lowered 5 ft. in two and one-half hours by five men.

The electrical control of the pumps is at the surface, placed back of the hoist, as are the controls of all of the machinery, and are handled by the hoist men, using a separate bell for signals.

The pumps have, to date, with the exception of a small amount of bearing trouble, given fairly good service, and the system of handling has resulted in the use of a minimum number of men and has given absolutely no trouble.

The most satisfactory features of this installation are the handling of the pipe lines, using the elevator for lifting the columns out of the spider and slips and lowering to the required depth when the slips are again introduced into the spider from which the pipe lines hang free in the shaft, and the lowering of the pumps from the surface by the worm-gear-driven winches and the lowering of our power lines from the surface on the ⅜-in. pilot line hoisting cable.

The first pump was put in operation on April 15 of this year; the second pump on June 23. The pumps are run continuously, handling from 1,100 to 1,150 gallons per minute. One pump will just hold the water after it has risen some 4 ft. in the shaft when the second pump is shut down, so there is no time to be lost in the lowering of pumps or pipe lines or other difficulties.

Much credit for this installation should be given to Mr. Beadle, of the Byron Jackson Pump Company, for his technical advice; to Mr. C. C. Julian and his oil-field superintendent for their advice in the use of oil-field methods in the handling of pipe lines; and to Mr. Collins, of the Joshua Hendy Iron Works, for the design of the worm-gear hand-operated winches for the handling of the pumps and pipe lines.

**STRIPPING ON MESABA RANGE**
(*From page* 918)

cu. yds. under these conditions. In another case the average depth of the overburden was 115 ft. We encountered water at the 60-ft. level, and the quantity of water handled per minute from that time until completion was 1,200 to 1,750 gallons per minute. We handled 3,300,000 cu. yds. under these conditions.

Open-pit operations are generally double tracked from one end to the other so as to permit free and rapid movement of trains. Gravity coal docks with a capacity of from 300 to 500 tons are constructed, and in the same vicinity, not closer than a full train length from the coal dock, the water tank is located, the distance separating them being such as to permit both to be used at the same time. Sufficient side tracks with shops, machinery and supply parts are maintained so that the plant investment may be operated as nearly to capacity as is possible.

Our operations have practically all been on a unit price basis. The mining companies have now perfected their own organizations and the field is thus limited from a constructor's standpoint.

Before the introduction of large power shovels it was a common practice to drill and blast the banks. The methods employed were gopher or coyote holes from the side, dug by hand to a depth of from 40 to 50 ft., and from the top with churn drills by hand and machines to a depth of from 35 to 40 ft. In each instance the holes had to be sprung frequently, after which they were loaded with black powder and fired by an electric exploder and battery, supported by tape fuse and cap to be used in case the battery failed to discharge the load. After observing costs most carefully and accurately for years, I am firmly of the opinion that there is no one item in connection with stripping costs that has been more abused than the use and application of explosives. I have observed many times banks being expensively drilled and shot, when, in their natural conditions, the material could be loaded much faster than it could be disposed of on the dump.

The employing and disciplining of labor has been quite a factor in maintaining satisfactory costs. We have always made it a practice to be as close as possible to our employes, from the highest to the lowest, and recognized and maintained the human element to the highest point consistent with a well-disciplined and satisfactory organization, or as nearly so as conditions would permit.

In May, 1922, at the Scranton Mine, Hibbing, Minn., for Pickands-Mather Company, we loaded with one Marion Model 300 Steam Shovel, working 54 10-hour shifts, 260,853 cu. yds. This, so far as we know, is the world's record.

### Mining Men of Southwest Meet at Nogales, Ariz.

A three-day meeting which had as its purpose the stimulation of mining was held at Nogales, Ariz., November 19-21. The meeting was held under the sponsorship of the Arizona Industrial Association in cooperation with the Arizona Chapter of the American Mining Congress, the Arizona Section of the American Institute of Mining Engineers, and the Nogales Chamber of Commerce.

Registration headquarters were opened at the Montezuma Hotel on Sunday. Mining men from Arizona and New Mexico and from Sonora, Mexico.

Monday's meeting was opened with P. G. Spilsbury, of the Industrial Congress, acting as chairman. Visitors were welcomed by H. J. Karns, mayor of Nogales, and H. W. Miller, chairman of the board of supervisors of Santa Cruz County.

W. B. Gohring, secretary of the Arizona Chapter of the American Mining Congress, spoke, his subject being "Is the Old Time Prospector Necessary?" W. V. De Camp, general superintendent of the United Verde Copper Company, gave a talk on "How We Prospect for Mines," and B. S. Butler, of the Arizona School of Mines, told of "How the United States Geological Survey Helps the Prospector."

Harry A. Clark, general manager of the Calumet and Arizona Mining Company, presided at the Tuesday session. Harold B. Merardi, of the Southwestern Engineering Company, spoke on the "Development and Treatment of Complex Ores by the Flotation Process." J. J. Jackowsky, consulting engineer for the Radiore Company, presented a paper on "Geophysical Prospecting."

Tuesday and Wednesday afternoons were spent in inspection trips to the Patogonia district and to the Montana mines, near Nogales. Trips were also made to the World's Fair and Morning Glory camps.

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### Big Tennessee Mining Company to Put in Electric Power

The Big Tennessee Mining Company at Chloride, Ariz., has ordered equipment preparatory to putting in electric power. When the electric power is in, new machinery will be installed and the shaft sunk to a depth of 500 ft.

### Phelps Dodge Corporation Plans Extensive Exploration in Bisbee District

Capt. J. P. Hodgson, general manager of the Copper Queen Branch of the Phelps Dodge Corporation, has given out the following statement:

"The Phelps Dodge Corporation, Copper Queen Branch, has planned and will commence to put into effect as soon as the necessary preparations can be made, a very thorough and comprehensive plan of development work. It is expected that this work will cover the major portion of the next four years. It is over and above the development work now being done, the aim being to thoroughly explore certain parts of the property in an effort to locate and bring into production additional ore bodies.

"During and since the war, the reserves in the Copper Queen mines have gradually diminished, largely due to the fact that no extensive campaign of development work has been inaugurated and made effective. The present plans call for a thorough exploration of the property. It is expected that this additional work will provide employment for between 200 and 300 men. It will most likely be pretty well toward the latter part of the year before the work can be started, as additional new equipment has to be ordered and received before the work can be fully inaugurated.

"This will be welcome news for the residents of the district, as it will mean an increase in number of employes, and also an increase in pay rolls."

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### California Mining Men Meet at Mariposa

The fourth annual Regional Conference of California Mining Men, sponsored by the mineral committee of the California Development Association, was held in the historic old Mariposa County Courthouse on October 25.

Fred Stevenot, director of the State Department of Natural Resources, presided. C. S. Knight, of the California Development Association, spoke on the influence of mining in general on the prosperity of the community. A. G. Wishon, president of the San Joaquin Light and Power Company, emphasized the parts his company was playing in cooperating with and furthering mining in the Mother Lode region. John E. Mansborgor, of the *San Francisco Chronicle*, spoke on the power and influence of the press. Fred Stevenot concluded the meeting with an addres on the conservation of natural resources.

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### Inventor Settles Case Against Copper Company

Claims of George Campbell Carson against the United Verde Copper Company for patents on a smelting furnace have been settled on terms "satisfactory to both parties," according to press reports from San Francisco.

The United Verde Company took a license for future use of the furnace, but the terms of settlement were not given out. Carson has claims against various copper companies now using the reverberating type of blast furnace that aggregate, according to some estimates, $7,000,000. He has twice won judgments against the companies in the United States Supreme Court.

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### Lead Industries Body Is Formed

The Lead Industries Association was formally organized in New York City November 14 by producers and consumers of lead. It intends to promote service among lead industries to the community at large and will parallel some activities of existing organizations in other nonferrous metal industries.

It also expects to disseminate accurate information regarding the use of lead products, collect statistics on marketing and consumption of lead and its products and develop methods to improve the welfare of those engaged in the lead industries.

The membership will comprise corporations interested in mining, smelting and manufacturing lead in the United States, Mexico, Canada, South America. Some companies to be represented are: Ahumada Lead, American Lead, American Metal, Andrews Lead, American Smelting and Refining, Bingham Mines, Bunker Hill, and Sullivan Mining and Concentrating, Cerro De Pasco Copper, Chief Consolidated Mining, Consolidated Mining and Smelting of Canada, Eagle-Picher Lead, El Potosi Mining (Howe

Sound Co.), Evans-Wallower Lead, Federal Mining and Smelting, Federated Metals, Fleck Brothers, W. P. Fuller and Company, General Cable, Glidden Co., Hecla Mining, Metals Refining, National Lead, Northwest Lead, Park Utah Consolidated Mining, Remington Arms, Sherwin-Williams, Silver King Coalition Mines, St. Joseph Lead, Tintic Standard Mining, Utah Apex Mining, Utah Copper, United Metals Selling, U. S. L. Battery, United States Smelting, Refining and Mining.

Officers are: Clinton H. Crane, president; Hamilton M. Brush and Ralph M. Roosevelt, vice presidents; Felix E. Wormser, secretary-treasurer.

## Mining Expenditures in Idaho in 1927 Show Big Increase

The sum of $10,066,465 was expended in Idaho in 1927 for mining development purposes by nonproducing mining companies, by producing nondividend-paying companies, and for assessment work on mining claims and new mining locations, as compared with $9,341,804 in 1926, an increase of $724,661, according to Ravenel Macbeth, secretary of the Idaho Mining Association. This expenditure was made from funds obtained outside of the state and was made without any profit.

Of this amount, $3,783,675 was expended by nonproducing development companies; $5,450,500 by producing nondividend-paying companies; $759,000 for assessment work on mining claims; and $73,470 for location work on new mining claims; a total of $10,066,465.

There were 708 operating mining companies that employed 2,938 men, and assessment and location work employed 382 men, a total of 3,320 men employed for mining purposes during 1927 without profit.

*Idaho Mining Expenditures During the Year 1927*

| | |
|---|---|
| Labor | $5,247,081.00 |
| Supplies | 2,593,139.00 |
| Mine equipment | 439,630.00 |
| Mill equipment | 141,760.00 |
| Smelter equipment | 1,216,000.00 |
| Ore transportation | 428,855.00 |
| Total | $10,066,465.00 |

## To Work on Tungsten Ores in Arizona

The E. C. O'Brien Company plans to erect a 50-ton capacity tungsten roughing plant at Sulphide Del Rey, in the Pinal Mountains, south of Globe, Ariz. The company owns 25 claims at Sulphide Del Rey. A 25-ton capacity tungsten-cleaning plant will also be built at Globe, which will handle the product from the roughing plant as well as consignments from small producers in the district.

## Empire Mine Makes New Discovery

An important ore discovery on the 7,000 level of the Empire mine, Grass Valley, California, has been reported. The company is pushing work in development at greater depth. The new discovery is said to be in new territory and is the most promising discovery made in some time.

## Colorado Mining Association Advocates Tariff For Lead

A committee of the Colorado Mining Association, of which George E. Collins, of Denver, is chairman, is advocating an application to the Tariff Commission, under the flexible provisions of the tariff law, for an increase of 33 1/3 percent in the tariff duty on lead products.

The present import duty upon the lead content of ores is 1½ cents per pound and upon metallic lead contained in bullion and bars 2⅛ cents per pound.

It is pointed out that during 1927 the lead content of ores imported into the United States for domestic uses amounted to 70,260,478 pounds; that lead bullion and bars imported for domestic purposes amounted to 26,467,216 pounds; and that the duties collected by the Treasury Department on these imports amounted to $1,660,544.

## Mill for Montana-Idaho Mines

Montana-Idaho Mines Corporation directors have authorized the driving of a tunnel 3,400 ft. long to tap the ore bodies of its properties in the vicinity of Winston, Mont., at a depth of 500 ft. and to build a central mill to handle the output. A second unit of its Spring Hill mill near Helena was started recently. The mill now has a capacity of 225 tons.

C. W. Newton, formerly manager of the Butte-Ballaklava, manager of the Seneca Copper Mining Co. of Michigan and the Callahan Zinc-Lead Co. of Idaho, has been put in charge of all operations.

## MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD, AND ZINC IN COLORADO IN 1927

(In terms of recovered or recoverable metal)

Advance figures by Chas. W. Henderson, of the United States Bureau of Mines, Department of Commerce

| County | Mines producing Placer | Lode | Total | Ore [1] Short tons | Gold [2] Value | Silver [2] Fine oz. | Silver [2] Value | Copper Pounds | Copper Value | Lead Pounds | Lead Value | Zinc Pounds | Zinc Value | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adams | 2 | ... | 2 | ..... | $3,340 | 23 | $13 | ..... | ..... | ..... | ..... | ..... | ..... | $3,353 |
| Boulder | .. | 33 | 33 | 21,867 | 88,183 | 41,598 | 23,586 | 3,436 | $450 | 167,288 | $10,539 | ..... | ..... | 122,758 |
| Chaffee | 1 | 5 | 6 | 318 | 391 | 2,035 | 1,154 | ..... | ..... | 68,700 | 4,328 | 47,000 | $3,008 | 8,881 |
| Clear Creek | 1 | 51 | 52 | 8,655 | 63,236 | 36,681 | 20,798 | 17,809 | 2,333 | 243,939 | 15,368 | ..... | ..... | 101,735 |
| Custer | .. | 4 | 4 | 36,089 | 10 | 342 | 194 | 99 | 13 | 683,983 | 43,091 | ..... | ..... | 43,308 |
| Dolores | .. | 13 | 13 | 60,743 | 8,488 | 173,395 | 98,315 | 131,000 | 17,161 | 9,987,777 | 629,230 | 10,615,000 | 679,360 | 1,432,554 |
| Eagle | .. | 5 | 5 | 57,811 | 7,910 | 85,741 | 48,615 | 89,000 | 11,659 | 4,117,060 | 259,371 | 7,800,000 | 499,200 | 826,755 |
| Fremont | .. | 1 | 1 | 26 | 27 | 136 | 77 | 801 | 105 | 2,492 | 157 | ..... | ..... | 366 |
| Garfield | .. | 1 | 1 | 66 | 11 | 194 | 110 | ..... | ..... | 10,142 | 639 | ..... | ..... | 760 |
| Gilpin | 8 | 26 | 29 | 3,865 | 28,398 | 7,621 | 4,321 | 3,710 | 1,141 | 92,635 | 5,836 | ..... | ..... | 39,696 |
| Gunnison | .. | 7 | 7 | 1,967 | 4,158 | 19,739 | 11,192 | 3,481 | 456 | 691,682 | 43,576 | 455,000 | 29,120 | 88,502 |
| Hinsdale | .. | 8 | 8 | 378 | 715 | 3,446 | 1,954 | 2,596 | 340 | 155,285 | 9,783 | 44,000 | 2,816 | 15,608 |
| Lake | .. | 39 | 39 | 141,075 | 247,607 | 411,471 | 233,304 | 172,450 | 22,591 | 13,562,762 | 854,454 | 23,690,000 | 1,516,160 | 2,874,116 |
| La Plata | .. | 2 | 2 | 613 | 23,103 | 8,912 | 5,053 | ..... | ..... | ..... | ..... | ..... | ..... | 28,156 |
| Mesa | .. | 1 | 1 | 1 | ..... | 81 | 46 | 893 | 117 | ..... | ..... | ..... | ..... | 163 |
| Mineral | .. | 4 | 4 | 3,592 | 246 | 214,850 | 121,820 | ..... | ..... | 75,286 | 4,743 | ..... | ..... | 126,809 |
| Moffat | 2 | ... | 2 | ..... | 476 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 476 |
| Montrose | 2 | ... | 2 | ..... | 92 | 2 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | 93 |
| Ouray | .. | 14 | 14 | 12,682 | 27,106 | 79,291 | 44,958 | 85,710 | 11,228 | 290,713 | 18,315 | 93,000 | 5,952 | 107,559 |
| Park | 1 | 9 | 10 | 1,928 | 39,719 | 3,913 | 2,219 | 3,298 | 432 | 39,477 | 2,487 | ..... | ..... | 44,857 |
| Pitkin | .. | 10 | 10 | 23,525 | ..... | 152,328 | 86,370 | ..... | ..... | 2,406,888 | 151,634 | 200,000 | 12,800 | 250,804 |
| Rio Grande | .. | 1 | 1 | 137 | 133,530 | 268 | 152 | ..... | ..... | ..... | ..... | ..... | ..... | 133,682 |
| Saguache | .. | 12 | 12 | 112,515 | 20,012 | 845,044 | 479,140 | 3,378,504 | 442,584 | 6,030,222 | 379,904 | ..... | ..... | 1,321,640 |
| San Juan | .. | 10 | 10 | 282,824 | 252,927 | 726,291 | 411,807 | 1,549,214 | 202,947 | 17,271,016 | 1,088,074 | 22,869,000 | 1,463,616 | 3,419,371 |
| San Miguel | .. | 12 | 12 | 312,490 | 922,806 | 905,949 | 513,673 | 219,443 | 28,747 | 9,647,546 | 607,795 | 708,000 | 45,312 | 2,118,333 |
| Summit | 7 | 12 | 19 | 34,411 | 99,122 | 39,910 | 22,629 | 4,137 | 542 | 1,227,730 | 77,347 | 5,208,000 | 333,312 | 532,952 |
| Teller | .. | 50 | 50 | 488,950 | 3,307,505 | 25,344 | 14,370 | ..... | ..... | ..... | ..... | ..... | ..... | 3,321,875 |
| Total, 1927 | 19 | 330 | 349 | 1,606,528 | $5,279,118 | 3,784,605 | $2,145,871 | 5,670,581 | $742,846 | 66,772,557 | $4,206,671 | 71,729,000 | $4,590,656 | [3] $16,965,162 |
| Total, 1926 | 31 | 387 | 418 | 1,839,740 | $7,078,033 | 4,704,122 | $2,935,372 | 3,403,850 | $476,539 | 68,987,800 | $5,519,024 | 65,000,000 | $4,875,000 | [4] $20,883,968 |

[1] Tonnage of lode mines only [2] Includes placer production as follows: 1926, $46,954 in gold and 569 ounces of silver; 1927, $94,434 in gold and 1,136 ounces of silver. [3] Average value of metals: Gold, $20.671835 per ounce; silver, $0.567 per ounce; copper, $0.131 per pound; lead, $0.063 per pound; zinc, $0.064 per pound. [4] Average value of metals: Gold, $20.671835 per ounce; silver, $0.624 per ounce; copper, $0.14 per pound; lead, $0.08 per pound; zinc, $0.075 per pound.

### Sidney J. Jennings Dies

Sidney Johnston Jennings, 65 years old, died of heart disease at his home, 285 Central Park West.

Mr. Jennings was president of the American Mining Congress in 1922-23, and of the American Institute of Mining Engineers in 1918-19. He was also vice president of the United States Smelting, Refining and Mining Company, director of Cia de Real del Monte y Pachuca and president of the Hanover Bessemer Iron and Copper Company. He held membership in a number of mining and metallurgical institutes of Great Britain and South Africa.

Born in Hawesville, Ky., the son of James R. and Katherine S. (Hennen) Jennings, he was sent abroad at an early age to be educated, and attended schools in France and Germany. Later he returned to the United States and entered Harvard University, from which he was graduated with a degree in civil engineering in 1885. He also took a postgraduate course at the University of California.

Mr. Jennings gained his first practical experience as a surveyor for the New Almaden Quicksilver Mines in California and as surveyor and engineer for the Anaconda Copper Mining Company in Montana. He went to South Africa in 1889 to become manager of the Willows Copper Company.

Later he became assistant general manager of the De Beers Consolidated Mines, Kimberley; manager of the Crown Deep Mine, Ltd., Johannesburg, and from 1896 to 1907 was manager of the Crown Mines and consulting engineer for H. Eckstein & Co., of Johannesburg, which controlled 40 percent of the gold output of the Rand.

After the occupation of Johannesburgh by the British Mr. Jennings was made chairman of the works committee of the town council and supervised the installation of electric trolley lines, a water supply system and underground sewers. He returned to New York in 1907 to assume his duties as vice president of the United States Smelting, Refining and Mining Company.

Surviving are his wife, the former Amy Florence (Horne) Valpy, of Newbury, England, whom he married in Kimberley, South Africa, in 1893, and four children, John Morris, Amy Sidney, Mary Agnes and Philip Hennen.

### New Mills in the Tri-State District

Construction of a 100-ton mill west of Aurora, Mo., has been started by Scott, Greip and Company. A mill has been purchased and is being moved to Aurora and will be ready for operation shortly.

Two shafts have been sunk into the ore and the owners claim lead and zinc in good quantities is being developed. Considerable ore has been cleaned and shipped that was made on hand jigs.

M. F. Scott is superintendent of the company.

The Century Zinc Company, in the Tri-State District, expects to have the Discard mill completed and ready for operation by the end of the year. The Bingham mill, which was on the adjoining land, has been moved to the Discard lease. The Discard lease formerly was known as the Vantage and was purchased by the Century more than a year ago.

The mill will be of approximately 400-ton capacity and will be complete in all details. The float plant will not be constructed until the results of some experiments now under way are completed.

A 150-ton mill, being erected in the Aurora district by the Triangle Mining Company, will be completed early in December, according to J. D. Morgan, superintendent.

### North Butte Mining Company Receivership Ended

The receivership of the North Butte Mining Company came to an end in the Federal court for the Montana district November 5, when Judge George M. Bourquin in a brief, though cutting decision, ordered the company property restored to the stockholders. Receivers were ordered to render final accounts on or before November 19 and these final accounts will be heard and ended December 3 and the receivers discharged.

Similar action to terminate the receivership as to the Minnesota property of the North Butte Mining Company is being instituted in Minnesota courts.

Paul A. Gow, president of North Butte Mining Company, says the company is paying off all its indebtedness, including bond issues, and that plans are being made for early resumption of operations at the company's mines at Butte.

The company will put on about 200 men at the start to clean up the mines and get the workings in shape for resumption of mining.

"We expect to increase this force constantly," said Mr. Gow, "until by the first of the year, it is our expectation to have 2,000 men at work.

"We have been able to regain control of our properties largely because of the confidence shown in the company by its Butte stockholders. These stockholders put up more than $400,000 of the $1,000,000 subscribed in the past few months for its rehabilitation.

"During the trials and tribulations of the North Butte Mining Company over the past two years," Mr. Gow continued, "the Anaconda Company has been most helpful to us. The Anaconda and the Montana Power Company were the two largest unsecured creditors of the North Butte and in the settlement of general claims against the company, they as well as practically all other general creditors in Butte, waived interest amounting to more than $18,000."

"The company has ousted those who by unwarranted receivership sought its destruction," said the court referring to the fact that the stockholders had ousted the directors and officials of the company who, it was declared had sought its ruin. Again in the course of his decision the court said:

"The receivership was unwarranted in the beginning, was invalid and became valid only by grace of the Circuit Court of Appeals, and the company's delay in moving to terminate it."

### Copper Output by World Smelters Tops All Records

Output of blister copper by world smelters in October eclipsed all previous records both on a monthly and daily basis, according to the *American Metal Market*. Reports from countries which furnish 98 percent of the world's total indicate an October output of 173,623 tons, equivalent to a daily rate of 5,601 tons. Non-reporting countries are estimated to have produced 3,000 tons last month, bringing the total to 176,600 tons. Previous to October the highest daily rate of output was in June this year, when it was 5,216 tons a day. In October last year the daily rate was only 4,686 tons.

In the first ten months of this year world blister output amounted to 1,553,400 tons. It is notable that the United States produced nearly 55 percent and North and South America 73 percent of the total world's output, production in the United States having been 853,571 tons and in Chile and Peru 291,603 tons.

### Plans Made for 1929 Meeting of Lake Superior Body

A meeting of the Executive Committee of the Lake Superior Section of the National Safety Council was held at Duluth, Minn., October 26. Plans for the 1929 annual meeting of the section, to be held at Duluth June 27 and 28, were taken up and in part completed.

Members of the Executive Committee include: Durant Barclay (chairman), F. S. Crawford, W. H. Carrick, B. D. Shove, L. C. Moore, S. J. Sicotte, A. C. Borgeson, E. W. R. Butcher, R. R. Trengove and J. P. Victor, secretary.

E. W. R. Butcher, of Duluth, will have charge of publicity. S. J. Sicotte, of Hibbing, Minn., has been assigned "unusual accidents." Under the head of mining exhibits, L. C. Moore, of Hibbing,

will represent Minnesota. W. H. Carrick, of Ironwood, Mich., will represent the iron mines of Michigan and Wisconsin. George Rupp, of Calumet, Mich., will represent the copper country of Michigan.

There will be industrial and mining exhibits at the meeting next June, which proved to be a popular feature at the last annual meeting. Various papers were discussed and the names of possible speakers were suggested for the program, all of which will be taken up in further detail at another meeting of the Executive Committee to be held December 21.

### Fahrenwald Nominated for James Douglas Medal

A. W. Fahrenwald, whose appointment as professor of metallurgy in the University of Idaho School of Mines recently was announced by President Frederick J. Kelly, has been formally nominated by the Michigan section of the American Institute of Mining and Metallurgical Engineers to receive the James Douglas medal, which is awarded annually by the institute for distinguished achievement in mining or metallurgy. Mr. Fahrenwald retires from the position of the dressing engineer with the United States Bureau of Mines to join the Idaho Mines School staff. Since 1919 Mr. Fahrenwald has been in charge of the Moscow Station of the Bureau and last year divided his time between Idaho and Michigan. During the past year his work in Michigan has contributed new milling practises which are expected to mean a saving of fully $2,000,000 per year to copper companies of that state.

In making its formal recommendation to the institute the Michigan section says:

"His (Fahrenwald's) work in the Michigan district, which is well known to all concerned will effect numerous savings in the present milling practice, and will permit the reclamation of millions of tons of tailings, and in addition permit the successful operation of properties hitherto considered too low in grade or too refractory to be worked at a profit."

### Zinc Stocks Lower

Zinc stocks in hands of American producers November 1 were 46,063 short tons against 47,915 tons October 1, American Zinc Institute reports. October production was 50,259 tons and shipments 52,106 tons, of which 1,980 tons were for export.

### Greene Cananea and Inspiration Consolidated Raise Dividend Rates

Directors of Greene Cananea Copper Company, which operates mineral lands in Mexico and Colorado, have declared a quarterly dividend of $1.50 on the common stock, placing it on a $6 annual basis, in contrast to a $4 basis previously. The dividend is payable January 7 to stockholders of record December 13.

Directors of Inspiration Consolidated Copper Company declared a dividend of 75 cents on the common stock. The last dividend was 25 cents, paid in April, 1927. It was explained that the new dividend now places the stock on a $3 annual basis against a $2 basis during the years 1923-26.

### National Metal Exchange to Open December 3

Erwin Vogelsang, president of the National Metal Exchange, following a meeting of the board of governors, announced that December 3 had been fixed as the official date for the opening of the new exchange at 27 William Street, New York City.

While trading will be confined to tin futures at first, it is within the scope of the exchange to later on take up other non-ferrous metals which lend themselves to futures trading and in which there is a real need for such a market.

### Canada Increasing Zinc and Lead Output

Canada's participation in the world's lead and zinc supply has increased notably since the war, says the Canadian Bank of Commerce. The value of the lead mines during 1928 is expected to be approximately $18,000,000, that of zinc $11,000,000, in both cases nearly four times the value reached in 1918. The relative figures for 1927 were $16,500,000 and $10,200,000. Canada's exports of lead and zinc go chiefly to Great Britain and Continental Europe, although shipments to the Orient have lately been increasing, especially in the case of Japan, which is taking large quantities of lead.

Denver Post.

*The Age of Action*

### Recovery of Metals from Secondary Sources

The value of the recovery of certain nonferrous metals from secondary sources in 1927 is reported to the United States Bureau of Mines, as $256,352,000, which is $18,188,900 less than in 1926. This decrease in total value, according to J. P. Dunlop, who compiled the figures, was due to a lower yearly average price of all the metals covered in the report other than nickel, for the total recoveries were about 11,000 tons more than in 1926. There were small increases in the recoveries of copper, brass, aluminum, nickel, and tin and small decreases in lead and zinc. The quantity of antimony recovered decreased 24 percent, although the quantity of primary antimonial lead made at regular smelters increased nearly 1,850 tons. The smelters that treat mainly ore recovered 104,934 tons of copper from scrap, which was 7,600 tons less than in 1926.

The most significant feature of the copper industry was the large increase in the quantities of scrap copper and brass exported. The combined shipments of copper and brass scrap increased from 34,845 short tons in 1926 to 68,706 tons in 1927.

All of the increase in secondary lead was in alloys. The recoveries as pig lead decreased 6,000 tons.

Zinc recovered by redistillation increased nearly 2,000 tons while that recovered by sweating and remelting declined about 1,750 tons. Less zinc dross was exported but the quantity of dross, skimmings, etc., used for lithopone and zinc chloride increased in 1927. The exports of zinc dross decreased about 6,000 tons which, in part, reflects the larger recovery by redistillation at domestic retort zinc smelters.

The secondary tin recovered as metal decreased 950 tons. Less tin was consumed in making tin plate so that the recoveries from tin dross and scruff treated were less. There was a large increase in the quantity of tin recovered in alloys such as bronze, babbitt, etc., and the detinning plants treated an increased quantity of tin plate clippings.

### Mesabi Chief Builds New Plant

A contract was recently awarded to the Warden-Allen Company for the erection of a new washing plant for the M. A. Hanna Company at Keewatin, Minn. The Mesabi Chief plant will be modern in every way. The building will be of steel construction. The treatment method will include screening and washing. This will be the thirty-fourth washing plant for iron ores on the Mesabi Range.

### Reopen Agnew Iron Mine

The Agnew iron mine, at Hibbing, Minn., Mesabi range, controlled by the Wisconsin Steel Co., the mining division of International Harvester Co., is to resume production after having been idle since 1920. A new shaft will be sunk to serve the property. The Agnew mine had shipped a total of 1,925,680 gross tons up to the end of 1920, and the estimated ore reserves are 2,770,783 tons. The property is a Great Northern lease.

### Smuggler Union Mine Will Close

Smuggler Union Mining Company, whose property in Colorado is the oldest mine in that state in point of continuous operation, will suspend operations before the end of the year, according to reports. A long period of profitable operation is given as the reason for abandoning the mine, which has been worked steadily for 55 years. The Smuggler Union was the chief agency in giving Telluride its fame as a mining camp. It is now employing about 250 men.

### Anaconda Reopens Badger State Mine

The Anaconda Copper Co. has reopened its Badger State mine, at Butte, Mont., at full production. This mine was closed in March, 1928, because of a fire. The mine has a production of about 1,000 tons of ore a day and normally employs about 600 men.

During the period of the Badger's shutdown the mine has been equipped with a large electric hoist, capable of lifting from a depth of 5,000 ft. This hoist is similar to those also recently installed in the Belmont and Mountain Co.

### Electrification by Pennsylvania Railroad

Electrification by the Pennsylvania Railroad of 325 miles of line and 1,300 miles of track, as recently announced by President Atterbury, will call for the use of approximately 55,000,000 pounds of copper, according to an estimate by the Copper & Brass Research Association. This is more than the entire copper production of the United States half a century ago. In 1878 the Nation's total output of the metal was about 49,000,000 pounds.

### Silver Suit to be Argued Before Court of Appeals

Argument before the Court of Appeals of the District of Columbia in the suit of the American Silver Producers' Association to compel the Government to purchase 15,000,000 ounces of silver at $1 per ounce is not likely to be heard until late in January or early in February. The association lost the case in the District of Columbia Supreme Court last spring when Justice Stafford decided that the organization lacked sufficient interest to bring the suit, although he did not pass on the merits of the controversy. The association noted an appeal and after the record is printed attorneys on both sides will be allowed 50 days to file briefs, after which the Court of Appeals will hear the case.

### Two Phelps Dodge Mines Make Safety Record

Both the Morenci mines of the Phelps Dodge Corporation and the Old Dominion Company at Globe, Ariz., went through the month of October without a lost-time accident. This is the first time that this record has been made by two of the corporation's mines in the same month. The Old Dominion Company also went through September without a lost-time accident.

### Golden Wonder Mines Will Erect Mill

The Golden Wonder Mines, Inc., in the Tip Top district, north of Canon, Ariz., has purchased a 300-ton mill, which will be erected to treat a large tonnage of low-grade ore in extensive dumps and also low-grade fill in old stopes above water level. Dump ore is estimated to contain 15 ounces of silver and 0.8 percent tungsten. Harley A. Sill, of Los Angeles, is consulting engineer.

## AMERICAN STANDARDS ASSOCIATION ESTABLISHED BY UNANIMOUS VOTE OF MEMBER-BODIES

### *W. J. Serrill, President; Farrell, Cortelyou, Lieb, Loree and Swope On Advisory Committee*

UNANIMOUS approval by the 37 member bodies of the establishment of the American Standards Association to succeed the American Engineering Standards Committee is announced by William J. Serrill, assistant general manager of the United Gas Improvement Company of Philadelphia. Mr. Serrill was chairman of the Standards Committee and now becomes president of the American Standards Association. One of the most important results of the abandonment of the committee form of organization will, according to Mr. Serrill be a much greater degree of participation by trade associations in the direction of the national industrial standardization movement.

One of the first acts of the association will be the organization of a board of directors composed of 12 industrial executives. This newly created board, which was established in recognition of the increasing part which executives are playing in the standardization movement, will control the general administration and policies of the association. The old main committee, made up of representatives of all the member bodies, now becomes the Standards Council, and in its hands will rest all matters connected with the adoption and approval of national standards.

The officers of the association are, in addition to Mr. Serrill: Vice president, Cloyd Chapman; secretary, P. G. Agnew; and assistant secretary, F. J. Schlink. The advisory committee of industrial executives includes: J. A. Farrell, president of the U. S. Steel Corporation, chairman; George B. Cortelyou, president of the Consolidated Gas Company; John W. Lieb, senior vice president of the New York Edison Company; L. F. Loree, president of the Delaware & Hudson Company; and Gerard Swope, president of the General Electric Company.

The American Engineering Standards Committee was organized in 1917 by the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society of Testing Materials. The purpose of the organization was to provide a method of cooperation which would prevent duplication in standardization work and the promulgation of conflicting standards. The United States Government Departments of War, Navy, and Commerce became members of the committee in 1919. New members were from time to time added until at the time of the present reorganization there were 37 member bodies. There are in addition 350 sustaining members, including manufacturers, distributors, associations, etc.

A broad range of industries and of types of standards are included in the

work of the association. The following types of standards are covered:

1. Nomenclature. Definitions of technical terms used in specifications and contracts and in other technical work.
2. Uniformity in dimensions necessary to secure interchangeability of parts and supplies, and the interworking of apparatus.
3. Quality specifications for materials and equipment.
4. Methods of test.
5. Ratings of machinery and apparatus which establish test limits under specified conditions as a basis of purchase specifications, or which establish requirements as to performance, durability, safety, etc., under operation.
6. The codifying of provisions for safety.
7. Rules for the operation of apparatus and machinery in industrial establishments.
8. Concentration upon the optimum number of types, sizes, and grades of manufactured products.

The method of work is simply a systematic plan of cooperation by which organizations interested in any particular project participate (1) in deciding whether the work shall be undertaken at all, (2) in formulating the standard, and (3) in its ultimate approval as an "American Standard."

The decision as to whether work on a standard shall be undertaken is made by a general conference of representatives of all the groups concerned with the standard or by any equivalent method which assures a consensus of opinion. One of the most important results of the reorganization is the more flexible procedure for adopting standards now available. Four methods are provided:

1. By sectional committees, which are essentially joint committees made up of officially accredited representatives of all groups having an important interest. The sectional committees may work:
   a. Under the administrative support and direction of one or more of the bodies principally concerned—termed "sponsors."
   b. Autonomously, reporting directly to the American Standards Association.
2. The approval of existing standards when it may be shown that the standard represents a real consensus.
3. By the approval of "proprietary" standards when it may be shown that they are supported by a consensus of those substantially concerned.
4. By the official acceptance of the interested groups concerned.

The United States Government cooperates actively with the association in several ways. In addition to the seven branches of the Federal Government represented on the Standards Council, 38 branches are represented on sectional committees. Twenty-one association projects are sponsored by various branches of the Federal Government, which are represented on almost every sectional committee working under association procedure. The Department of Labor is cooperating in all safety code work and is publishing approved safety codes as Government documents. The association assists the Federal Specifications Board by circulating proposed specifications for criticism by industry in order to determine their acceptability to industry.

There are now national standardizing bodies similar to the American Standards Association in 19 foreign countries. The association is constantly in touch with these, and all standards are exchanged. National standards developed abroad are thus made available in this country for the use of exporters, manufacturers, and others.

Up to the time of its reorganization into the American Standards Association 285 projects were given official status, as follows:

| | |
|---|---|
| Civil engineering and building trades | 35 |
| Mechanical | 77 |
| Electrical | 53 |
| Automotive | 5 |
| Transportation | 10 |
| Naval architecture and marine engineering | 1 |
| Ferrous metallurgy | 4 |
| Non-ferrous metallurgy | 10 |
| Chemical | 8 |
| Textile | 2 |
| Mining | 19 |
| Wood | 5 |
| Pulp and paper | 2 |
| Petroleum | 19 |
| Miscellaneous | 35 |
| | 285 |

# *Personal Items*

Durand Hall, mining geologist, of Berkeley, Calif., recently visited Butte on professional business.

W. H. Crago, mining engineer, of Duluth, Minn., has gone to South America on professional business.

Louis Wright, mining engineer, of San Mateo, Calif., has returned to his home after an extended absence.

Watler Douglas, president of the Phelps Dodge Corporation, recently visited the company's properties in the Southwest.

Col. Wm. B. Thompson has arrived in Arizona to spend some time at his winter home near Superior.

The Northwest Mining Association has elected the following seven trustees for the year 1929: Frank M. Smith, Leon Starmont, L. K. Armstrong, Rowland King, A. L. Hooper, Edward Pohlman, F. Cushing Moore.

G. S. J. Trench, of C. S. Trench & Co., has been elected president of the American Tin Trade Association.

Ernest W. Ellis, assistant professor of mining and metallurgy and for the past five months acting dean of the University of Idaho School of Mines, has tendered his resignation to President Frederick J. Kelly, of the University to become metallurgical expert with the Anaconda Copper Mining Company in connection with the Carson patent case. Professor Ellis has asked that the resignation be effective at once that he may join the Anaconda staff as quickly as possible.

O. M. Highley has been appointed safety engineer for the New Chicago Mines Company in the Tri-State District.

H. Robinson Plate, Consulting Mining Engineer, resumed engineering practice with offices in the Holbrook Building, San Francisco, Calif.

D. H. Pape, formerly of the staff of the National Coal Association and later secretary of the Monongahela Coal Operators' Association, is now assistant to the president of the Cosgrove-Meehan Coal Corporation, with headquarters at Johnstown, Pa.

Howard S. Estill has severed his connection with the Stonega Coke & Coal Company, of Big Stone Gap, Va., as general superintendent and is opening an office at 812 Fayette Bank Building, Lexington, Ky., where he will do consulting mining engineering work. Mr. Estill went with the Stonega Company as superintendent of the Loda plant in 1918 and has been general superintendent for the past five years.

Paul Halbersleben, superintendent of mines for the O'Gara Coal Company, has been elected a director to fill the vacancy caused by the resignation of Joseph D. Zook, who has become president of the new Illinois Coal Operators' Association.

The Raleigh Smokeless Fuel Company, Beckley, W. Va., has announced the appointment of C. C. Crowe as traffic manager. Mr. Crowe has been with the organization at Raleigh, W. Va., for the past nine years and is well known to the coal trade.

George C. Foedisch, Philadelphia, has been elected a director of Penn Coal and Coke Corporation to succeed John Magee, resigned.

A. J. Sayers, an engineer of the Link-Belt Company of Chicago, has been appointed representative of the company on the board of governors of the Manufacturers' Division of the American Mining Congress. He succeeds Rex Martin, resigned.

S. P. Kinney, who resigned recently as metallurgist of the Bureau of Mines of Minneapolis, has become affiliated with H. A. Brassert & Co., Chicago, consulting engineers.

C. H. Macdonald, formerly manager of the market research department, Colorado Fuel & Iron Co., Denver, has been appointed director of sales under J. B. Marks, executive vice president. He will have general charge of the sales and market research departments.

The staff of the Boone County Coal Corporation was entertained at a turkey dinner at Sharples, W. Va., November 21 by Col. W. M. Wiley, general manager of the organization. The guests included Gen. Supt. T. W. Guy, superintendents, foremen and sub-foremen. The dinner was followed by a conference at which Colonel Wiley was the speaker.

### Coal Trade Association of Indiana Formed

At a meeting of Indiana operators in Terre Haute recently a state-wide coal association, with membership embracing shaft and strip, union and non-union mines, was organized. The plans of the new organization, the Coal Trade Association of Indiana, include a progressive campaign for the recovery of lost markets and the extension of the use of Indiana coal through cooperative advertising and research work. Other lines of endeavor will be credit, traffic, and statistics.

A board of directors was chosen composed of H. A. Glover, vice president, Knox Consolidated Coal Company, chairman; R. H. Sherwood, president, Central Indiana Coal Company, vice chairman; W. J. Freeman, Bon Ayr Coal Company; H. E. Howard, Binkley Coal Company; C. N. Templeton, Templeton Coal Company; H. B. Lee, Maumee Collieries Company; R. J. Smith, Princeton Mining Company; J. T. Moorman, Patoka Coal Company; and George A. Enos, Enos Coal Mining Company. Jonas Waffle, who has been connected for several years with the association activities of the Indiana operators, was elected managing director.

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### Coal Mining Institute to Meet at Pittsburgh

The Coal Mining Institute of America will hold its annual convention at Pittsburgh December 12-14. The speakers will include the following:

Walter H. Glasgow, of Harrisburg, secretary of Mines of Pennsylvania, "The Bituminous Mining Code of Pennsylvania."

Jesse K. Johnston, of Greensburg, Pa., and John L. Clarkson, of the Illinois Power Shovel Company, of Nashville, Ill., "Mechanical Loading in Underground Workings."

George H. Ashley, of Harrisburg, state geologist of Pennsylvania, "The Outlook for Coal."

Prof. A. J. Hoskin, of Lafayette, Ind., "Spontaneous Combustion of Storage Coal."

Richard Maize, of Uniontown, Pa., state mine inspector, "Mine Fires, Including Spontaneous Combustion in Gob Sections."

George S. McCaa, of the Bureau of Mines, "Modern Mine Rescue Data."

J. B. Morrow, engineer, of Pittsburgh, "The Champion Coal Cleaning Plant of the Pittsburgh Coal Company." The plant will be visited by the delegates December 14.

W. W. Adams, statistician of the Bureau of Mines, "Reduction of Accidents."

*The annual banquet of the National Coal Association, held in Cleveland, November 16*

### National Coal Holds Meeting—Mahan Reelected President

All records of annual meetings were broken at the eleventh annual convention of the National Coal Association at Cleveland, November 14, 15, and 16. From the splendidly balanced program of the Cleveland meeting every one of the several hundred operators in attendance got something which he can advantageously apply to the conduct of his own business and in his relations with his fellow operators. Detailed report of the sessions on November 14, 15, and 16 will be carried in printed copies of the proceedings, which will be available shortly.

Classification of coal in accordance with consumers requirements and extension of combustion engineering studies in the coal industry were recommended by Thomas W. Harris, Jr., of Wilmington, purchasing agent of the DuPont Company before the convention. "The future will demand coal to be sold on a merchandising basis with a constant endeavor to cut costs through the mechanization of mines and to increase quality by better preparation and coal cleaning plants," he said.

Combinations in coal districts to cut production to consumption requirements were advocated by Samuel A. Taylor, of Pittsburgh. He stated that this would enable the districts to secure a price which would yield a fair profit on the investment and permit them to cover the cost of maintaining over-capacity until it was consumed by public demand. The plan would involve an increase to consumers of 50 cents per ton in the present price of coal.

In his annual report as executive secretary, H. L. Gandy reviewed the work of various committees of the association. He stated the number of bituminous mines in the country is decreasing while the average production per mine is increasing. He opposed Government regulation of the industry.

A number of resolutions were adopted by the members, the one applying to legislation reading as follows:

"The National Coal Association reaffirms its attitude toward proposed Federal legislation affecting the bituminous coal industry by saying that it opposes legislation which would seek to single out this industry for regulatory action. This particularly applies to such bills as S. 4490. At the same time it is recognized that there are other lines of legislation in which the industry may be interested.

"Therefore be it resolved, that it is recommended that the officers and directors of the National Coal Association keep in close touch with the national legislative situation and cooperate with representatives of other industries for such modification of existing laws and such new legislation as may be in the interest of industry generally and the welfare of the public."

Recommendation of the treasurer that the assessment for the ensuing year be continued at 1 mill per ton of production was unanimously approved by the directors, who also voted favorably on a motion to amend the by-laws to increase the representation of the strippers on the board from one to two members.

The election of officers gave another term in the presidency to E. C. Mahan, president of the Southern Coal & Coke Co., of Knoxville, Tenn. F. S. Love, J. M. Pauley, and P. J. Quealy were reelected vice presidents, and W. H. Cunningham was elected a vice president to succeed the late G. H. Caperton. C. E. Bockus and Harry L. Gandy were reelected treasurer and executive secretary, respectively.

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Lehigh Valley Coal Corporation has extended to December 31 the time for deposit of securities in connection with the recent Lehigh Valley Coal Company and Lehigh Valley Coal Sales Company merger.

### Changes in Management of Pennsylvania Coal Company

According to a recent announcement by Michael Gallagher, president, Pennsylvania Coal Company, John C. Brydon, who last July succeeded Joseph P. Jennings as general superintendent, has been made vice president in charge of operations of the Pennsylvania Coal Company, Hillside Coal and Iron Company, New York, Susquehanna & Western Coal Company, Northwestern Mining and Exchange Company, and Blossburg Coal Company.

Mr. Brydon succeeds A. K. Morris, who has severed his connection with the above-mentioned companies, to act as traffic commissioner for the anthracite industry.

C. H. Fredericks, former auditor, has been elevated to the position of secretary-treasurer, succeeding F. H. Wright, resigned. G. Marshall Gillette, who has served as assistant general superintendent for several months, has been made general manager of the Pennsylvania Coal Company and Hillside Coal and Iron Company and the New York, Susquehanna & Western Coal Company.

C. J. Westlake, former assistant auditor, has been named successor to Fredericks as auditor, and R. W. Radcliffe moves up to the position vacated by Mr. Westlake's advancement.

Under the new executive administration, the positions of general superintendent and assistant general superintendent will be abolished. Whether there will be any changing of colliery superintendents and other minor transfers in jobs following the reorganization scheme is not announced at this time.

Mr. Brydon has had many years of experience in producing, selling and transporting coal. He is well known throughout the soft coal fields, where before coming to the anthracite regions he was regarded as an outstanding leader in the industry. He worked for years in an official capacity for the Baltimore & Ohio Railroad, which is a heavy carrier of bituminous. This work brought Mr. Brydon into contact with the marketing end of the business.

### Williamson, W. Va., Operators Hold Annual Meeting

The sixteenth annual meeting of the Operators' Association of Williamson Field was held November 8 at the Mountaineer Hotel, Williamson, W. Va., and was well attended. It was presided over by Mr. L. E. Woods, president, Crystal Block Coal & Coke Co., at Welch, and also president of the association.

Many matters of interest were discussed relating to various topics in which the industry is concerned, such as state compensation rates, physical examinations for employes, and hospital contracts. Discussion was also had with reference to sales realization report and the past sales report. Executive Secretary Harry L. Gandy, of the National, outlined the program for the eleventh annual meeting at Cleveland, and spoke of the activities of the National.

The following officers were elected: L. E. Woods, president; F. S. Landstreet, vice president; W. S. Leckie, treasurer; and Joseph J. Ardigo, secretary. The following additional members of the board were elected: George Dunglinson, Jr., T. H. Huddy, George Coffey, L. D. Heustis, W. A. Richards, E. E. Ritter, and John L. Tierney.

### Trevor B. Simon Dies

Trevor B. Simon, construction engineer of the Consolidation Coal Company, died suddenly at Pittsburgh, Pa., October 28. Death was due to heart complications.

Mr. Simon entered the service of the Consolidation Coal Company at Fairmont, W. Va., during the latter part of 1926, and resided with his family at 613 Fairmont Avenue. He was graduated from the Ohio State University in 1907 with the degree of Mining Engineer. From 1907 to 1913 was contracting engineer in charge of the coal-washing department of the Jeffrey Manufacturing Company; from 1913 to 1914 was contracting engineer with the Roberts and Schaefer Company; 1915-1916, contracting engineer of the Pittsburgh Coal Washer Company; 1916-1917, chief engineer of the Wharton Steel Company; 1917-1918, United States Army Ordnance; 1921-1926, president of the C. L. Miller Company.

He was a member of the Royal Society of Arts, The American Mining Congress, the A. I. M. E., and the honorary scientific fraternity Sigma Xi. He was born at Dubois, Pa.

### Frank N. Speller Elected Chairman of Carnegie Tech. Metallurgical Advisory Board

Frank N. Speller, director of the Department of Metallurgy and Research of the National Tube Company, was elected chairman of the Metallurgical Advisory Board to the Carnegie Institute of Technology and the U. S. Bureau of Mines at a meeting of the board in Pittsburgh October 19. Mr. Speller, whose term is for three years, succeeds T. D. Lynch,

*Kansas City Times*

*Chicago Tribune*

metallurgist, of the Westinghouse Electric and Manufacturing Company.

The evening meeting of the board terminated the second open meeting of the board, which included all-day technical sessions for all who were interested in metallurgical research. More than 150 of the prominent metallurgists of the country attended the sessions to hear reports and discussions of cooperative research in metallurgy that has been conducted during the past four years under the joint auspices of the Carnegie Institute of Technology, the Bureau of Mines, and the Metallurgical Advisory Board.

Special interest was shown in the progress report of the five-year program on studies in the physical chemistry of steel making now being conducted under the three-party agreement and in the reports of the work accomplished by the Bureau of Metallurgical Research of the Carnegie Institute of Technology.

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### Survey of Commercial Stocks of Coal

Commercial stocks of bituminous coal, used largely for industrial purposes, amounted to 41,100,000 tons on October 1, 1928, according to a survey by the Bureau of Mines. In comparison with the amount reported on July 1, the date of the last previous survey, this is a decrease of 600,000 tons. The stocks on October 1 compare favorably with the average for this season in other recent years.

Exports during the third quarter of 1928 averaged 399,000 tons a week against 270,000 tons in the previous quarter and 351,000 in the third quarter of last year. The weekly rate of home consumption average 8,246,000 tons, slightly less than in the corresponding period a year ago.

In addition to the stocks in the hands of consumers there were 9,443,011 tons of bituminous coal on the docks of Lakes Superior and Michigan.

The stocks of domestic anthracite held by the coal merchants reporting are close to the average for this season.

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### Mine Inspection Started in West Virginia

In connection with the campaign of Robert Lambie, chief of the West Virginia State Department of Mines, urging all mine superintendents to take greater precautions for safety on their operations, an inspection of mines in the Morgantown region has been started.

C. E. Foster, district mine inspector for the Cabin Creek section of Kanawha County and William Prentice, of War, McDowell County, have been sent to assist H. I. Connors, local district inspector.

### Charter Granted to Insurgent Anthracite Union

A state charter has been issued to the Anthracite Mine Workers of Pennsylvania, which is an insurgent offspring of the United Mine Workers of America. The charter, signed by Gov. John S. Fisher, was issued at the Bureau of Corporations of the state department.

The new organization was formed by Frank McGarry, of Pittston, whose unsuccessful efforts to succeed Rinaldo Cappellini as president of District No. 1, of the United Mine Workers, in the anthracite field, resulted in the split. The organization was incorporated under an act of 1889, which provides that all statewide labor organizations shall be incorporated by the commonwealth.

The charter rights provide that the members of the new union have formed themselves into "an association for their mutual aid, benefit and protection in their trade concerns."

In addition to McGarry, the organizer and head of the association, the incorporators are Walter Harris, Edward Hogan, John T. Hermansen, and John Vellfield, and the headquarters of the corporation is Wilkes-Barre.

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### Noted Scientist Proposes "Supreme Court" for Coal

Arthur D. Little, of Cambridge, Mass., recently elected president of the Anglo-Chemical Society of the Chemical Industry, proposes the establishment of a "supreme court" of natural sciences, a permanent non-political commission of outstanding executive, economic and technical experts, and including three or four cabinet members to study coal and its derivities.

"Coal," says Dr. Little, "is the only resource in sight available in sufficient quantity as a raw material to meet the ultimate demand. * * * There should be a way for the home to get its coal more cheaply. Integrated mining, I think, will reduce waste, stabilize the output, and hold the centers of production longer than otherwise to their present localities, to the advantage of distribution."

Dr. Little also expresses the belief that coal, rather than oil, will be the predominant source of mechanical energy of the future.

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### Electrical Inspectors for Bituminous Mines

In an effort to provide electrical inspection comparable with that in the anthracite mining district four men have been appointed by Secretary Walter H. Glasgow, of the State Department of Mines, to serve as temporary electrical inspectors in the bituminous coal field.

The appointees and the headquarters of their stations are: G. Frank Newman, Uniontown, with offices there; Clyde H. Maize, Uniontown, stationed at Greensburg; James T. Gatehouse, Johnstown, with offices in that city; and Michael Lecorchick, Erie, with headquarters at Pittsburgh.

Secretary Glasgow said all four men are practical electricians, and that they have obtained leaves of absence from coal and electrical manufacturing companies. Their duties will consist in making periodical inspections of electrical equipment in the mines of the western part of the state. The Department of Mines decided upon the emergency appointments as a means of preventing the recurrence of bituminous coal disasters. Five of the major disasters in the soft coal district have been attributed this year to faulty electrical equipment.

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### Winter Meeting of West Virginia Mining Institute

An automobile tour of the Winding Gulf coal fields will be one of the attractions at the winter meeting of the West Virginia Coal Mining Institute at Beckley December 3 and 4. The tour will occupy the whole of the second day.

The program includes the following papers: "Modern Tendencies in Tipple Design," by Thomas A. Stroup, chief engineer of the West Virginia Coal and Coke Company, Omar.

"Cheap Coal," by Josiah Keely, president and general manager of the Cabin Creek Consolidated Coal Company, Kayford.

"New Markets for West Virginia Coal," by David B. Reger, assistant geologist in charge, West Virginia Geological Survey, Morgantown.

"Safety Courts for Promoting Safety," by Thomas G. Fear, general manager of operations, the Consolidation Coal Company, Fairmont.

"Reminiscences," by J. R. Cameron, Westinghouse Electric Company, Bluefield.

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The natural resources department of the United States Chamber of Commerce has under consideration the feasibility of formulating a national policy looking to the maintenance and most effective use of the mineral resources of the country. The inquiry will seek to ascertain what can be done to assure an adequate supply of minerals upon which industry depends; measures to conserve vanishing resources; methods for the more economical use of minerals; and determination of the availability of existing deposits.

### Truax-Traer Buys Cabin Creek Coal Properties

Announcement was made recently of the acquisition of the entire capital stock of the Cabin Creek Consolidated Coal Company, by the Truax-Traer Coal Company, of which W. H. Cunningham is president. The Cabin Creek Company is one of the largest operating companies in southern West Virginia, and will be operated as a separate company, with the following officers: President, Josiah Keely, of Kayford, W. Va.; vice president and sales manager, Charles R. Moriarty, Cincinnati, Ohio; secretary-treasurer, Edgar Needham, Charleston, W. Va.

The purchase of the Cabin Creek property is looked upon in coal circles as the first step in a large combination of coal companies.

The Truax-Traer Company recently bought $2,500,000 Illinois strip mine coal properties. In North Dakota, the company owns and operates strip lignite mines.

The West Virginia Southern Coal Company had an option on the Cabin Creek properties, which expired September 15.

### Bethlehem Workers Make New Safety Record

Accidents were reduced 25 percent in plants and mines of the Bethlehem Steel Corp. during the first nine months of this year, compared with the like period in 1927. The corporation surpassed its best previous safety record notwithstanding a rate of operations in excess of 1927 for the same period. Fatal accidents were reduced 37 percent this year from last year's experience. The Lebanon group of employes won first prize of $1,000 for the best safety record in the third quarter. The Harlan-Moore group took second prize of $500, while the Bethlehem group took third prize of $250.

### T. C. & I. Reopens Hamilton Mine In Alabama

The Tennessee Coal, Iron & Railroad Company has resumed operations at its Hamilton Mine, near Pratt City, Ala., after a long period of idleness. The company sank a shaft on this property prior to closing it down and coal will be brought out through this opening instead of through the slope, as formerly. A large modern washery and other plant structures and buildings were provided at the same time, all facilities being adequate to care for an output of 3,000 tons per day when required. It is understood that this mine is to ultimately become the principal producer for the requirements of the corporations, the output being steadily increased to meet the deficit of the other large coal mines where the supply is being gradually exhausted. The company has a very extensive body of Mary Lee coal to be taken out through the Hamilton shaft.

### Anthracite Industry Increasingly Active

Increased activity in the anthracite industry is evidenced by the indexes for October, prepared by the Federal Reserve Bank of Philadelphia from reports received by the Anthracite Bureau of Information from leading collieries in Pennsylvania. Employment increased 1.8 percent over September, although it is still 5.8 percent below the same month month last year. Pay rolls increased 29.5 percent over September, and also are 9.5 percent above the index for October, 1927, indicating a higher rate of colliery operations.

### Annual Meeting of Harlan County Coal Operators' Association

Featuring the opening of its new mine rescue station, the Harlan County Coal Operators' Association held its twelfth annual meeting at Harlan, Ky., on Friday, November 23. L. P. Johnson, D. B. Cornett, and E. R. Clayton were reelected as president, vice president, and secretary, respectively. Judge H. B. Lindsay, of Knoxville, was toastmaster at the dinner, and the speakers included Secretary Clayton, who described the mine rescue station provided by the association; J. F. Bryson, the new safety director of the association; G. S. McCaa, chief engineer in charge of primary instruction units, U. S. Bureau of Mines, Pittsburgh Station; J. A. Dickinson, superintendent of the Mahan Ellison Coal Corporation; J. F. Daniel, chief, Kentucky Department of Mines; and President Mahan and Executive Secretary Gandy of the National Coal Association.

### Coal Carbonization Plant for Lukens Steel Co.

International Combustion Engineering Corporation has closed contracts with the Lukens Steel Company, of Coatesville, Pa., which provide for the building of a low temperature coal carbonization plant there. This will be the first low temperature coal carbonization plant identified with the steel industry and the second installation in America.

Ground will be broken at Coatesville the first of the year and the plant is expected to be in operation early in 1930. It will be owned and operated by the International Coal Carbonization Company, a subsidiary, which will sell the gas to the Lukens Steel Company under a long-term contract.

Approximately 1,750,000 cu. ft. of gas will be produced daily. This is a high quality gas which will be used for the heat treating of steel throughout the Lukens plant and will replace raw producer gas now used for this purpose.

### William Nisbitt Heads Coal Mining Institute

William Nisbitt, of Greensburg, Pa., has been elected president of the Coal Mining Institute of America. Mr. Nisbitt will succeed W. Harry Howarth, of Brownsville, Pa., following the annual meeting in Pittsburgh December 12, 13 and 14.

Robert M. Lambie, chief of the West Virginia Department of Mines; George S. McCaa, chief engineer of the United States Bureau of Mines Station, Pittsburgh, and Thomas W. Lowther, of Indiana, Pa., were named vice presidents. H. D. Mason, Jr., of Ebensburg, Pa., was reelected secretary-treasurer.

### Coal Company Officials Killed in Explosion at Kentucky Mine

Three coal company officials were killed November 27 in a local gas explosion in the Himler Coal Company mine at Himlerville, Ky.

The explosion victims, all burned so badly that identification was difficult except by personal effects, were Richard Williams, Huntington, president of the Glogora Coal Company; Charles H. Beidenmiller, Huntington, general manager of the company, and Charles D. Schlegel, of Glo, Ky., superintendent of the company's Kentucky operations.

Following an investigation, John F. Daniel, chief of the Kentucky Department of Mines, declared that the explosion resulted from ignition of gas by an open carbide lamp.

Two of the three men killed, Daniel said, carried open lamps, while the third had an electric safety lamp when they entered the mine to inspect the property, closed for four months, and ascertain its value. Brattices were down, he said, and had permitted an accumulation of gas in the number two right entry. When the men walked into that section of the mine the gas was ignited and they were instantly killed.

Williams and Beidenmiller were both prominent in coal circles in southern West Virginia and eastern Kentucky and were close friends of Robert M. Lambie, chief of the West Virginia Department of Mines who was preparing to drive to Himlerville when notified that the bodies of the men had been located. Williams was a former president of the Northeast Kentucky Coal Operators Association and the son of M. W. Williams, Philadelphia coal operator, while Beidenmiller was a native of Lykens, Pa.

### Research Laboratory for Coal Urged at International Conference

The attention of the coal industry, not only in the United States, but the whole world, was focused upon the sessions of the Second International Conference on Bituminous Coal in Pittsburgh, Pa., November 19 to 24. Space will not permit a discussion or review of the many papers presented. These will be carried in full, together with the discussions, in a volume which will shortly be issued by the Carnegie Institute of Technology under whose auspices the conference was held.

The remarks of Dr. Thomas F. Baker, president of Carnegie Tech, at the close of the conference, are of general interest. He urged the establishment of a research laboratory for the study of bituminous coal, and stated that he hoped "means can be found which will permit Carnegie Institute of Technology to undertake a program of research on a subject which is of the greatest importance to the industrial life of Pittsburgh, namely, bituminous coal."

Dr. Baker lauded the foreign scientists. He declared that the foreigners by attending the sessions learned to better understand American conditions and their ability to deal with future industrial problems in the United States would increase.

"American coal men have come away from the conference with greater respect for science and with the feeling that they can not afford to ignore research in making plans for the future of their industry," Dr. Baker continued.

"The conference has shown that coal as a basis of chemical products is increasing in importance. On the other hand, little has been said that would indicate an increased amount of coal will be consumed in the production of power. Therefore to find an opportunity for larger sales to those concerns which burn new coal, but rather to those which treat it in by-product coke ovens or for the manufacture of gas or in a score of different ways that have been considered at the conference.

"If the power houses do not absorb more coal, this is no reason for discouragement. I believe there are industries in process of development which will make up for the decline in the consumption of coal in the production of power."

### First Aid Training In West Virginia

The Lake Superior Coal Mining Company, McDowell County, W. Va., recently finished a 100 percent first aid training of its employes, and the Houston Collieries Company has had trained 180 men in first aid and intends to train all employes in all operations. The Pond Creek Pocahontas Coal Company and the Fordson Coal Company at Twin Branch, W. Va., are also preparing to train their employes. The staff of the United States Bureau of Mines Car No. 7 has been conducting the first aid training.

### Lake Cargo Coal Rate Cases to be Argued February 18

The Supreme Court has advanced and assigned for argument on February 18 the Lake cargo coal rate case. This case involves the validity of a voluntary reduction by railroads of 20 cents per ton on bituminous from Southern mines in Virginia, West Virginia, Kentucky and Tennessee to Lake Erie ports for transshipment to the northwest. The lower court sustained the reduction last spring against the protest of northern operators and railroads and the Interstate Commerce Commission on the ground that the northern fields were entitled to this freight differential. The United States on behalf of the commission, the Pittsburgh Operators Lake Rate Committee, the Burton Coal Company and the B. & O. Railroad appealed the case which was decided by the lower court in favor of the Anchor Coal Company.

### Railroads Denied Blanket Increase On Mineral Products

The I. C. C. denied an application of western, continental and Illinois railroads to cancel existing tariffs and to file blanket rate increases on iron ore, pig iron, coal, coke and oil between various points. As a result of this action the present rates will continue.

### Maryland Mines Bureau Report

The fifth annual report of the Maryland Bureau of Mines of the State of Maryland, containing statistics of Cumberland coal trade from 1842 to 1927, has been issued by J. J. Rutledge, under the supervision of the State Board of Labor Statistics. This report is very comprehensive concerning the safety work in the state, together with the production, men employed and names of all mines classified as to whether active or not.

### Ohio Coal Statistics

The total output of Ohio coal mines during the year 1927 was 15,762,369 tons, according to a report made by the Department of Industrial Relations. This tonnage is almost 12,500,000 less than in 1926 when 28,039,107 tons were produced. The output in 1925 was 27,564,760 tons; in 1924, 30,096,893 tons; in 1923, 40,904,275 tons and in 1922, 27,526,555 tons.

There were 38,440 men employed in the coal mines of Ohio during the year 1927 and the wages paid was $22,907,416. Belmont County ranked first with 3,691,788 tons.

Of the total production in 1927, 1,096,020 tons were pick mined, 12,279,470 tons were machine mined and 2,386,879 tons were stripped. Seven percent of the total output was produced by pick mining, 77.9 percent by machine mining and 15.1 percent by stripping.

### Plan Larger Power Show

The seventh annual exposition of power and mechanical engineering will be held in New York December 3-8, and space reservations already made indicate that this will be one of the largest. It will be held as usual at Grand Central Palace, and will occupy the full four floors of the building. Coincident with this exhibition will be held the annual meeting of the American Society of Mechanical Engineers, and also the convention of the American Society of Refrigerating Engineers.

One of America's leading contributions to marine science was the development of methods for burning pulverized coal, according to a paper read by Carl J. Jefferson, Commander J. S. Evans, and Commander Joseph Broshek at the annual meeting of the Society of Naval Architects and Marine Engineers in New York. The paper detailed the experiments carried on under the joint auspices of the Shipping Board and the Navy Department at the fuel testing laboratory at the Philadelphia Navy Yard.

The Supreme Court, in an opinion by Justice Brandeis, has reversed a decision of a Louisiana district court which upheld the Conservation Commissioner of Louisiana in refusing to grant J. S. Herkness a permit to manufacture carbon black by the use of natural gas in the Monroe gas field. The Supreme Court holds that under legislation of the state limiting the use of natural gas in the production of carbon black, the conservation commissioner does not have power to refuse permits for the use of natural gas in the production of carbon black.

Two hundred field parties of the Geological Survey have completed mineral surveys of the United States and Alaska for the 1928 field season. They included geologists who investigated mineral deposits of many kinds in many different regions, and oil and gas and coal mining engineers. The work included studies of metal-mining regions in Montana, Idaho, Colorado and Nevada; coal fields in New Mexico and Montana; phosphates in Idaho; potash in Texas; and lead and zinc in Arkansas.

# WITH THE MANUFACTURERS

### Anaconda Copper Rebuilds Plant

The Anaconda Copper Mining Company, through its subsidiary the American Brass Company of Waterbury, Conn., is rebuilding its electrical cable plant at Hastings-on-Hudson, a suburb of New York City.

This plant will be constructed to produce the highest quality power cable of all types. A testing laboratory for the most advanced high tension cable work and for the examination of insulating oils, paper and cable sheath is being provided.

The Hastings plant, originally operated under the name of the National Conduit & Cable Company, is one of the oldest makers of power cables in the industry. This step of The American Brass Company is only a part of the rehabilitation program undertaken at Hastings since its purchase a few years ago.

The Hastings plant is one of the largest copper cable mills in the country. The products run annually around 100,000,000 pounds. This figure includes other materials as well as copper in the cable output.

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### Philip Carey Mfg. Co. to Build Largest High-Pressure Steam Plant in World

A project of interest to industrial and public service companies has been announced by the Philip Carey Mfg. Co., Cincinnati, Ohio, manufacturers of asbestos and magnesia high pressure steam pipe insulation. This company is to construct at the Lockland, Ohio, works a boiler and power plant designed for 1,800 lbs. steam pressure. This will be the highest steam pressure ever used in America, and the plant will be the largest high pressure steam plant in the world. W. E. S. Dyer, Consulting Engineer, Philadelphia, Pa., will design and have charge of the construction of the new work.

The high pressure steam generating equipment will be furnished by Combustion Engineering Corporation of New York, and will operate at 1,800 lbs. pressure. Integral economizers, water-cooled furnace walls, air preheaters, superheaters and pulverized fuel equipment will comprise these units.

The main generating units will consist of two 5,000 H. P. verticle triple expansion, direct connected engines, operating with 1,400 lbs. pressure at the throttle, at a temperature of 800° F. and exhausting against 60 lbs. back pressure above the atmosphere. To each engine will be direct connected a 3-phase alternator.

The operating cycle of this plant will make it one of the most efficient steam plants in the world.

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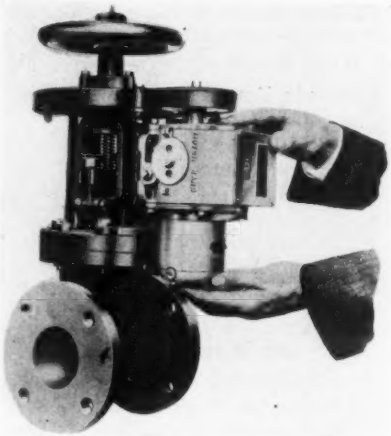
### New Motor-Driven Mechanism for Operating Valves

A new motor-driven valve-operating unit has been announced by the Cutler-Hammer Mfg. Co., Milwaukee, Wis., which makes possible automatic operation of all valves up to 6 in.



Although so small that it can be held in one hand, this unique operating unit has a rating of 15 lb. ft. It can be operated automatically by means of float switches, temperature controlling devices, pressure regulators, etc., or by conveniently located push buttons. This valve-operating unit is similar in principle to the standard C-H "Dean" operating unit, which has a successful record of 12 years.

It is designed primarily for valve-operating service in industries where regulation of pressures and temperatures of gases and fluids is necessary, but is likewise adaptable to many miscellaneous applications, such as operating skylights, awnings, radiators, garage doors, etc.

Literature describing this new unit (called C-H type Ao Valve Operating Unit) will be sent free upon request to the Cutler-Hammer Mfg. Co., 1298 St. Paul Avenue, Milwaukee, Wis.

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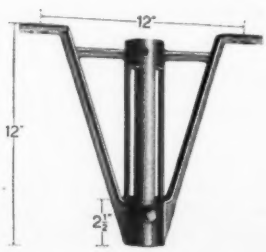
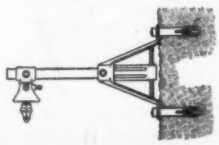
### New Pipe Extension Bracket for Roof or Rib

To simplify the problem of suspending trolley wires in mines where roofs are high and irregular and to compensate for recesses caused by slate falls, etc., the Ohio Brass Company, Mansfield, Ohio, is making an adjustable pipe bracket, which can be easily and securely fastened to the mine roof with two expansion bolts. The bracket is a triangular-shaped frame with a pipe-supporting sleeve extending 12 in. from the roof or wall supporting surface. The sleeve is made to accommodate either a 1¼-in. or 1½-in. pipe. The sleeve has a collar fitted with two set screws, 180 degrees apart, which firmly hold the pipe in place. The hollow in the roof is overcome and level trolley suspension procured by inserting in the sleeve the required length of pipe for each location. An insulated pipe hanger is threaded to the lower end of the pipe and a trolley wire clamp is used in the regular manner for holding the trolley wire.

The bracket can also be mounted on the rib, supporting the pipe horizontally. The trolley wire can then be supported from the pipe by means of a pipe adapter with an insulated hanger and trolley clamp. The pole bracket is made of O-B Flecto malleable iron, hot-dip galvanized.

*Pipe Bracket installed on roof*



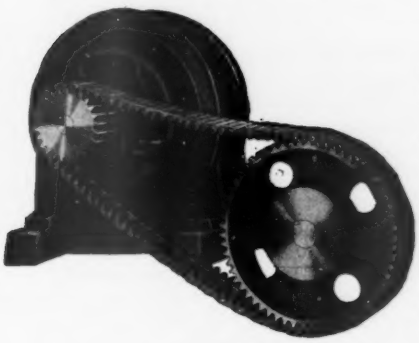
*Pipe Bracket installed on side wall*

### Link-Belt Drives from Stock Now Available Up to 60 Hp.

Link-Belt Company's new silent chain drives from stock book, just published for their trade, evidences the soundness of an idea advanced by that organization some four years ago, when they inaugurated the plan of furnishing silent chain drives from stock. At that time they announced that silent chain drives of ½ to 10 hp. would be available from stock, as a joint result of standardization and quantity production.

Theretofore, for more than 20 years the installation of silent chain drives had been strictly an engineering problem. By their plan they propose to so simplify the ordering of drives, through the provision of carefully arranged tables, etc., that their customers would be enabled to order direct from stock. In 1926 the range of horsepowers was increased to 15 hp.

Now, two years later, and only four years after the idea gained its first impetus, the demand for drives from stock has made it necessary to increase the range to 60 hp. According to their latest silent chain publication, Book No. 725, it will be possible to obtain drives as high as 60 hp., in practically any reduction from 1 to 1 to 7 to 1, for immediate delivery, by distributors in the principal cities of the United States.



The "drives from stock" plan does not, of course, in any way affect the range of horsepowers available in the silent chain engineering drives which this company furnishes to industry in general, in drives up to 1,000 hp. and over.

Link-Belt Company's production of silent chain drives is entirely concentrated in one plant—the Dodge Works, at 515 North Holmes Avenue, Indianapolis, of which James S. Watson is manager.

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Mr. H. A. Barker, a member of the Export Division of the Dorr Company, sailed for South America on October 13 for an eight months' visit in connection with his company's sanitary and metallurgical interests in that continent.

### Frederick Kent Copeland Dies

Frederick Kent Copeland, president of the Sullivan Machinery Company since 1892, died at Claremont, N. H., on Saturday, November 10. He was on a visit to the company's eastern works at Claremont when he was taken ill. It became necessary to operate for appendicitis, death resulting two days later.

*Frederick Kent Copeland*

Mr. Copeland was born in Lexington, Mass., and was graduated from Massachusetts Institute of Technology in 1876. After several years spent in Iowa and Colorado in mining engineering work, he helped organize the Diamond Prospecting Company in 1884, and became its president. This company engaged in contracting with the Diamond core drills made at Claremont, N. H., by the Sullivan Machinery Company.

In 1892 the two companies were merged, with Mr. Copeland as president. Under his leadership Sullivan products were developed for a wide range of purposes, serving the mining, quarrying, construction and manufacturing industries, manufactured at plants at Claremont, N. H., and Michigan City, Ind., and a world-wide sales organization has been built up.

Mr. Copeland maintained active leadership up to the date of his final illness. He was a member of numerous engineering societies, including the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the New York Engineers' Club, and of the Bankers' Club of New York, and was a past president of the Engineers' Club of Chicago, of the Western Society of Engineers, and of the National Metal Trades Association. He had served as a trustee of Massachusetts Institute of Technology, and in earlier years as a trustee on the village board of Winnetka, Ill., where he made his home for nearly 40 years. Mr. Copeland leaves two brothers, Robert James Copeland, of Canyon City, Colo., and William R. Copeland, of Hartford, Conn.; and a sister, Mrs. Russell Allen, of San Diego, Calif; Mrs. Copeland; a son, Frederick W., vice president of the company in charge of foreign business (at present in France); and a daughter, Mrs. N. H. Blatchford, both of Winnetka, Ill.

In a souvenir booklet presented to Mr. Copeland on the occasion of his completion of 40 years of service, his associates said to him: "Your success has been built on unswerving loyalty to the principle of service. Service to the customer, to the men and women in the company, to the stockholder. A record of 40 years of untiring effort."

---

### Commander Byrd Takes M. S. A. Heating Pads With Him To Pole

The *Eleanor Bolling*, the last of Commander Richard Byrd's expedition ships to leave New York, took with it a quantity of "Torridaire hot pads," a new heating pad placed on the market by the Mine Safety Appliances Company of Pittsburgh, Pa.

The Torridaire hot pad consists of a canvas bag containing the heating chemical and a rubber pouch in which the bag is inserted during use.

To use the pad, the canvas bag is removed from pouch, the clip unfastened, two tablespoons full of water poured into bag, clip fastened and the bag shook for two minutes. It will then heat to the required temperature.

The Torridaire hot pad can be used intermittently over an indefinite period until it has been used for a total of at least 80 hours. When the life of the heating chemical is exhausted a new recharge can be obtained.

This new first aid product is expected to prove very valuable to the members of Commander Byrd's crew.

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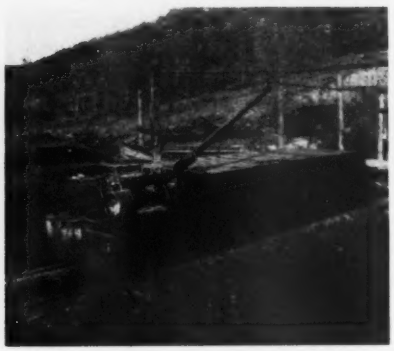
### New Circuit Breaker for Small and Isolated Installations

Type FK-33 is the designation of a new oil circuit breaker announced by the General Electric Company for manual or electric operation. These devices are rated 4,500 volts, 200 and 400 amperes, 2-, 3- and 4-poles, single- and double-throw and have interrupting capacities of approximately 20,000 kv-a. at rated voltage. It is recommended for use in small plant and industrial installations and for stations where a substantial and reliable breaker of moderate interrupting capacity is required.

### Applying Anti-Friction Bearings to Locomotive Motor Armatures

The following interesting account of how an 11-year-old locomotive was rejuvenated is given by the Timken Roller Bearing Company:

"There is little doubt that interest in the possibilities of anti-friction bearings as applied to mine locomotives is steadily increasing. As far as their application to locomotive journals is concerned, the advantages are fairly obvious, but those to be expected from the application to



*Increased service resulted from mounting the armatures of this locomotive in Timken bearings*

motor armatures may not be as readily apparent. For the latter reason the results obtained by applying anti-friction bearings to the motor armatures of a locomotive that had been in service for a long time on plain bearings are interesting. Especially so, perhaps, because they afford definite information as to the effects of such armature bearings on the general efficiency and performance of the locomotive as a whole.

"The locomotive in question is a 15-ton, 3-motor, 105-hp., 250-volt, outside frame type, having an unusually narrow gauge—30 in. It was purchased in 1914 by the Shawmut Coal Mining Company for use in their No. 31 mine, and has been in service more or less continuously ever since. The service to which it is put is severe, consisting of nine trips per day over a total distance of seven miles, three and one-half each way. The grades average 2.3 percent, some of them individually going as high as 6 percent, and the loads are heavy, averaging as much as 80 tons per trip. From the foregoing it can be seen that the service is severe enough to form a practical test of the relative suitability of any bearings with which the locomotive might be equipped.

"About three months ago it was decided to mount the armatures in Timken bearings. In the two months that have passed since the locomotive has been put in operation with the roller bearings some interesting facts have developed concerning comparative performance. In the first place, the average tonnage hauled has increased 200 tons per day. This increase may be attributed to several factors. First, there is a saving of 15 minutes per trip in the time of haulage. Secondly, the locomotive is now able to pull its full complement of 75 cars per trip on every trip.

"The reduction in operating expense effected by a radical cut in maintenance costs has been worth while. The increased effectiveness of the locomotive itself remains for consideration in any estimate of the over-all improvements that have resulted from the change. While a good many circumstances, the age of the locomotive, the hard service to which it has been put, and the narrow gauge for which it was designed, which affected its motor capacity, combine to make it rather an exceptional case, the value of the results obtained remains. At least they help to establish the entire suitability of roller bearings for such service generally, and to give a good idea of the improvements that may be expected to follow their use."

---

### A New Portable Oil Testing Set

The Westinghouse Electric and Manufacturing Company have recently developed a new ½ kv-a. portable oil-testing set which accurately determines, up to 25,000 volts, the dielectric strength of insulating oils.

The complete set is mounted in a cast aluminum case, and comprises, in addition to the transformer, a double-pole

self-restoring push switch, control rheostat, portable plug for connecting to an ordinary 110-volt light socket, voltmeter calibrated in kilovolts, and an oil test cup fitted with standard testing electrodes and a feeler gage for setting, all of which are mounted on a panel at the top and inside of the case.

When making a test, the gap between the electrodes is set with the feeler gage, and the cup is filled with the sample of oil to be tested. The rheostat control arm is moved forward, giving a gradual increase in voltage, until the oil in the test cup flashes over. The rheostat control handle automatically returns to the start position when released. The voltmeter reads the equivalent of the test voltage, and the value of the oil failure is thereby observed. The cycle may be repeated as often as necessary. The arrangement of the apparatus permits rapid testing with a high degree of accuracy.

Tests have shown that as little as .005 percent of moisture will reduce the dielectric strength of oil to about one-half its strength when dry. To make sure the proper dielectric strength is maintained, the oil in any piece of apparatus should be tested frequently and at regular intervals.

The N. E. L. A. recommends that oil samples from all power station and substation apparatus be tested at least once every three months, and that samples from distribution transformers be tested at least once a year. A standard test for insulating oil is made between two disc electrodes 1 inch in diameter and spaced 0.1 inch apart with their flat surfaces opposite and parallel. With this arrangement good insulating oil will average 22,000 volts or better on breakdown tests.

The principle of operation of this set entirely eliminates all difficulties due to high starting currents and distorted voltage waves which are frequently encountered with oil-testing apparatus.

---

A new acetylene plant at East Avenue and Short Street, South Charleston, W. Va., bringing the total number of Presto-O-Lite plants throughout the country up to 35, started producing on October 29. Dissolved acetylene for welding and cutting will be supplied to local industry from this point.

Mr. J. J. Robinson is in charge of the plant and Mr. S. P. Murphy, whose headquarters are at Cincinnati, is district superintendent.

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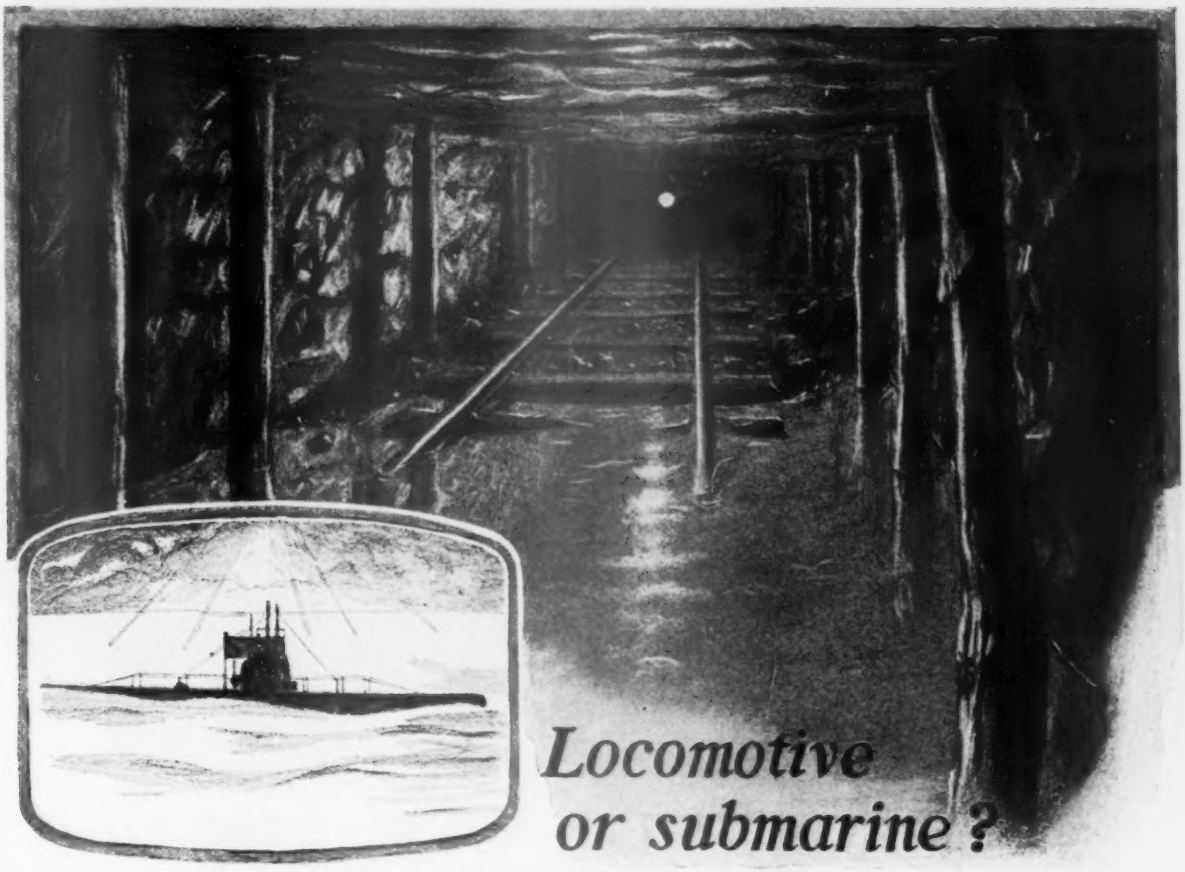
Mr. A. T. Hastings, who has for several years been manager of the Los Angeles office of the Dorr Company, sailed for Europe on October 20 to join the Dorr Company Ltd., London. Mr. A. M. Kivari succeeds Mr. Hastings as manager of the Los Angeles office.




Modern mining machinery is designed to stand hard use—but it is not designed to operate in water! There are many places—at the working face, along the haulways—where water accumulates in troublesome quantities. This water cuts down efficiency of machinery and increases the cost of repairs and maintenance. All such places may be easily and automatically kept dry by a few minutes work—digging a small hole for the LaBOUR GATHERING VALVE. Connected to a LaBOUR Centrifugal or any other pump capable of handling small amounts of air, the operation of this valve is entirely automatic, keeping the place dry.

The low cost of installing and operating these small pumping units is well repaid by the savings on other equipment.

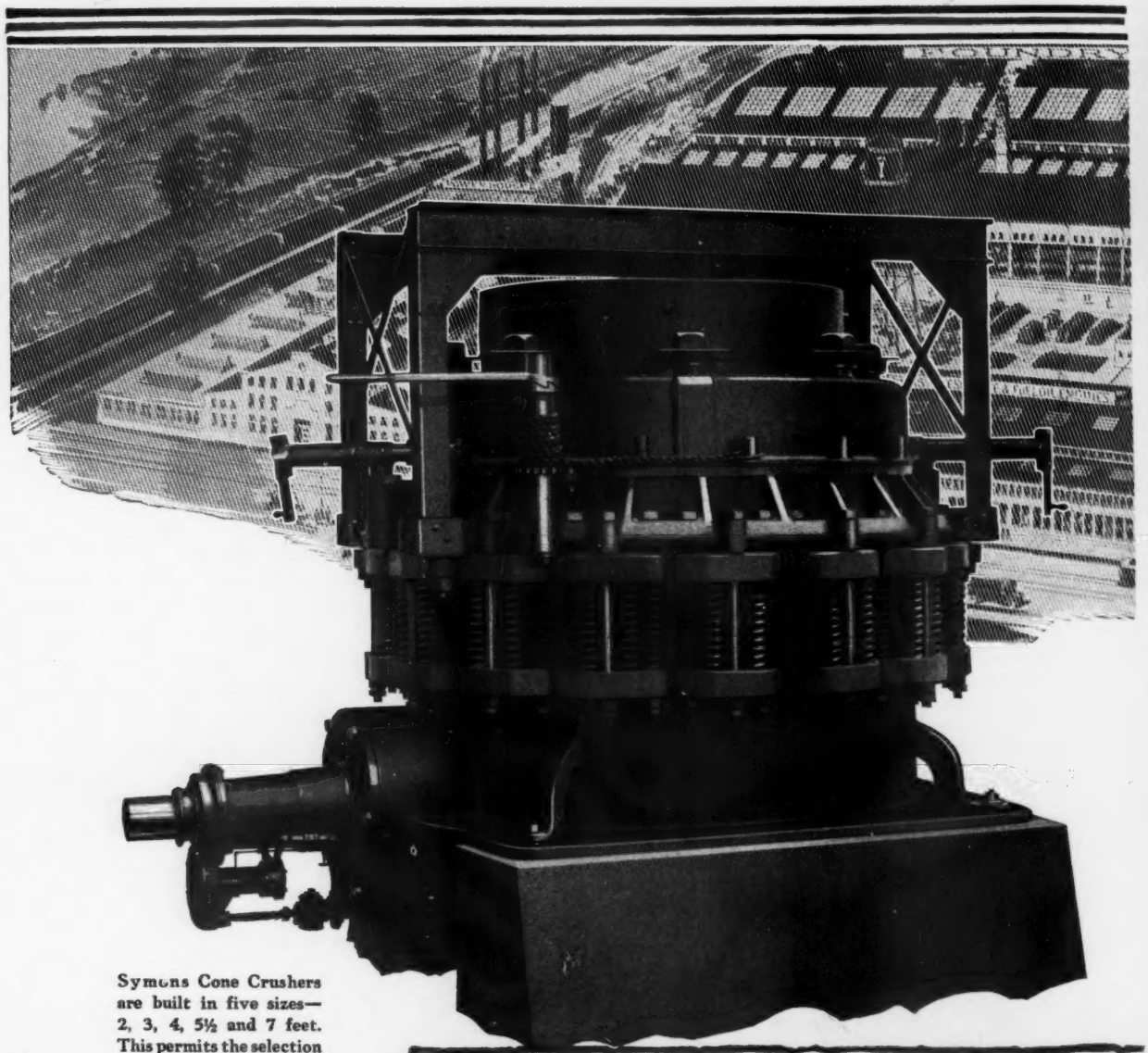
*Send for folder that describes the unusually simple and positive action and easy usability of these valves*

THE LABOUR COMPANY
CHICAGO HEIGHTS, ILLINOIS

# LABOUR GATHERING VALVES will clear all these places easily and automatically

ELCOMET IS A METAL HIGHLY RESISTANT TO ACIDS AND ALL CAUSTIC

# SYMONS BUILT BY

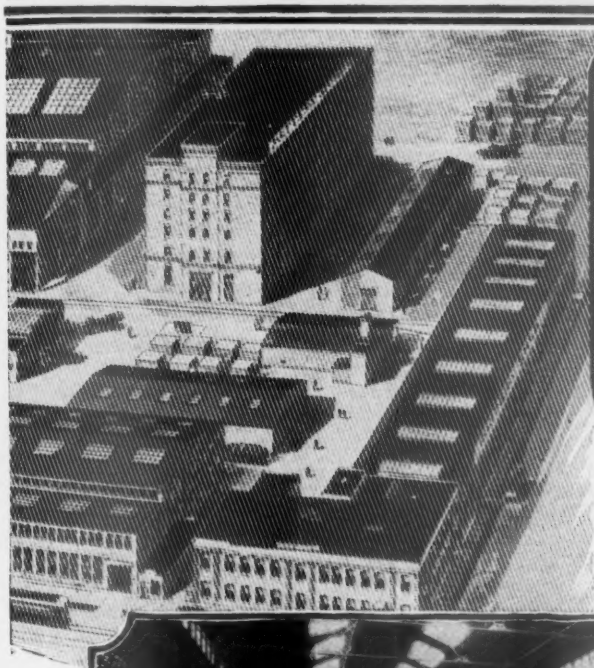


Symons Cone Crushers are built in five sizes—2, 3, 4, 5½ and 7 feet. This permits the selection of a proper size for any sized crushing plant.

NORDBERG

LOS ANGELES MILWAUKEE

# CONE CRUSHERS
# NORDBERG



A view down the center of the Machine Shop, 800 feet in length. Similar bays are at either side.

A portion of the erecting floor showing Symons Cone Crushers in the course of erection.

The Nordberg plant, which has contributed many of the outstanding installations in machinery to all lines of industry, has also produced the major portion of Symons Cone Crushers now in service. Nordberg facilities, combined with the experienced Symons organization, assures continuance of service to those whose operations involve the crushing of materials.

MFG. CO.
WIS. U.S.A. NEW YORK

# BUYER'S DIRECTORY

**ACETYLENE, Dissolved (Or in Cylinders)**
Prest-O-Lite Co., Inc., 30 E. 42d St., New York City.

**ACETYLENE GAS**
Prest-O-Lite Co., Inc., 30 E. 42d St., New York City.

**ACETYLENE GENERATING APPARATUS**
Oxweld Acetylene Co., 30 E. 42d St., New York City.

**ACID, SULPHURIC**
Irvington Smelting & Refining Works, Irvington, N. J.

**AERIAL TRAMWAYS**
American Steel & Wire Co., Chicago and New York.

**AFTERCOOLERS (Air)**
Ingersoll-Rand Co., New York City.

**AIR COMPRESSORS**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.

**AIR COMPRESSOR OILS**
Standard Oil Co. (Ind.), Chicago, Ill.

**AIR FILTERS—Bag type**
American Coal Cleaning Corpn., Welch, W. Va.

**AIR HEATERS**
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**AIR LIFT PUMPING**
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

**ANNUNCIATOR WIRES & CABLES**
John A. Roebling's Sons Co., Trenton, N. J.

**ANNUNCIATOR WIRES & CABLES, INSULATED**
American Steel & Wire Co., Chicago, Ill., and New York.

**ANTI-RUST OILS & GREASES**
Standard Oil Co. (Ind.), Chicago, Ill.

**ARMATURE COILS & LEADS**
General Electric Co., Schenectady, N. Y.
John A. Roebling's Sons Co., Trenton, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**ARMORGRIDS**
Hendrick Mfg. Co., Carbondale, Pa.
General Electric Co., Schenectady, N. Y.

**ASPIRATORS**
American Coal Cleaning Corpn., Welch, W. Va.

**AUTOMATIC CAR & CAGER STOPS**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.

**AUTOMATIC CAR CAGES**
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

**AUTOMATIC CAR DUMPERS**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

**AUTOMATIC FLAGGING SIGNALS**
American Mine Door Co., Canton, Ohio.

**AUTOMATIC (Mine Doors, Trucks and Electric Switches)**
American Mine Door Co., Canton, Ohio.

**AUTOMATIC MINE SWITCHES**
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**AUTOMATIC SWITCH THROWERS**
American Mine Door Co., Canton, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**AUTOMOBILE CABLES**
John A. Roebling's Sons Co., Trenton, N. J.

**BAG TYPE AIR FILTERS**
American Coal Cleaning Corpn., Welch, W. Va.

**BALLAST UNLOADER ROPES**
John A. Roebling's Sons Co., Trenton, N. J.

**BALL BEARINGS**
S K F Industries, 40 E. 34th St., New York City.

**BALL & ROLLER BEARINGS**
S K F Industries, 40 E. 34th St., New York City.

**BARS, STEEL**
Carnegie Steel Co., Pittsburgh, Pa.
Timken Roller Bearing Co., Canton, Ohio.

**BATTERIES**
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.

**BATTERIES, Armature**
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**BATTERIES, Blasting**
Hercules Powder Co., Wilmington, Del.

**BATTERIES, DRY (for Bells, Buzzers, Signals, Blasting)**
National Carbon Co., Inc., 30 East 42nd St., New York City.

**BATTERIES (Storage, Gas Welding, Cutting, Dissolved Acetylene)**
Prest-O-Lite Co., 30 East 42d St., New York City.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**BEARINGS**
S K F Industries, 40 E. 34th St., New York City.

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**BEARINGS, ANGULAR CONTACT**
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**BEARINGS, ANTI-FRICTION**
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**BEARINGS, ARMATURE**
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**BEARINGS, AUTOMATIC**
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S K F Industries, New York City.

**BEARINGS, ROLLER**
S K F Industries, New York City.

**BEARINGS, SHAFT, SELF-OILING**
S K F Industries, New York City.

**BEARINGS, TAPERED ROLLER**
Timken Roller Bearing Co., Canton, Ohio.

**BEARINGS, THRUST**
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Timken Roller Bearing Co., Canton, Ohio.

**BELL CORD**
John A. Roebling's Sons Co., Trenton, N. J.

**BELT DRESSING**
Standard Oil Co. (Ind.), Chicago, Ill.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**BELTING, SILENT CHAIN**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

**BINS (Coke and Coal)**
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**BITS, Carbon (Diamonds) for Core Drill**
R. S. Patrick, Sellwood Building, Duluth, Minn.
Diamond Drill Carbon Co., World Bldg., New York.

**BITS, Diamond Drilling**
R. S. Patrick, Sellwood Building, Duluth, Minn.

**BIT SHARPENERS**
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Ingersoll-Rand Co., 11 Broadway, New York City.

**BLACK DIAMONDS**
Diamond Drill Carbon Co., World Bldg., New York.
R. S. Patrick, Sellwood Building, Duluth, Minn.

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**BLASTING MACHINES**
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Hercules Powder Co., Wilmington, Del.

**BLASTING POWDER**
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

**BLASTING SUPPLIES**
Hercules Powder Co., 934 King St., Wilmington, Del.

**BLASTING UNITS (Dry Battery)**
National Carbon Co., Inc., 30 East 42nd St., New York City.

**BLOCKS, PILLOW**
S K F Industries, New York City.

**BLOWERS, CENTRIFUGAL**
American Coal Cleaning Corpn., Welch, W. Va.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Robinson Ventilating Co., Zelienople, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**BLOWERS (or Compressors)**
General Electric Co., Schenectady, N. Y.

**BLOWERS (Tubing)**
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Robinson Ventilating Co., Zelienople, Pa.

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Robinson Ventilating Co., Zelienople, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**BLOWPIPES, Brazing, Carbon Burning, Cutting, Lead Burning Welding, Welding and Cutting**
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**BOND TERMINALS**
American Mine Door Co., Canton, Ohio.

**BORTZ**
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**BRACES, GAUGE**
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Central Frog & Switch Co., Cincinnati, Ohio.

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**BREAKER MACHINERY**
American Rheolaveur Corporation, Wilkes-Barre, Pa.
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**CABLE GREASE**
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**CABLES**
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Roebling's Sons Co., John A., Trenton, N. J.
Ohio.

**CABLES (Connectors and Guides)**
American Mine Door Co., Canton,

**CABLES, INSULATED**
General Electric Co., Schenectady, N. Y.
John A. Roebling's Sons Co., Trenton, N. J.

**CABLES, SUSPENSION BRIDGE**
John A. Roebling's Sons Co., Trenton, N. J.

**CABLEWAYS**
American Steel & Wire Co., Chicago, Ill., and New York.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**CAGE DUMPERS, ROTARY**
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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

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Mining Safety Device Co., Bowerston, Ohio.
Roberts & Schaefer Co., Chicago, Ill.

**CAGERS, AUTOMATIC**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.
Phillips Mine & Mill Supply Co., Pittsburgh, Pa.
Roberts & Schaefer Co., Chicago, Ill.

**CAGERS, AUTOMATIC & MANUAL**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.
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**CAGES**
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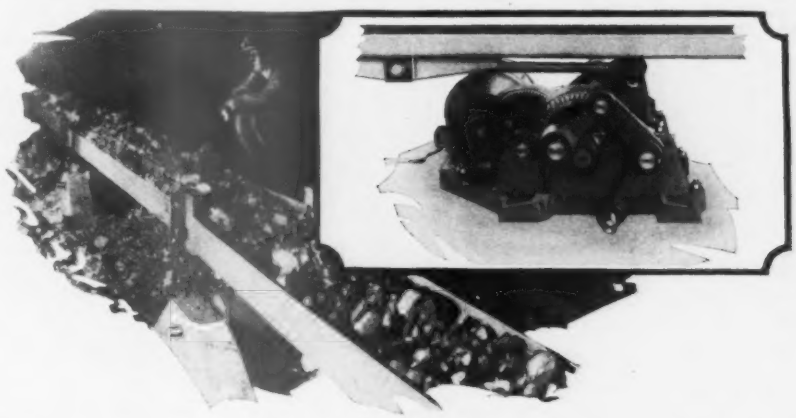
# Your COAL moves forward smoothly, continuously, *quietly*



With the Vulcan Shaking Chute on the job, your coal moves forward at a uniform speed. The forward stroke of the drive kicks the coal forward. Momentum makes the forward motion continuous. Almost noiseless except for the swishing of the coal as it slides in a steady stream toward the car.

The operation is simplicity itself. No wearing parts to get out of order. Chute sections, mounted on rollers, are moved by reciprocating action.

Less than 9-inch clearance required. Low in first and ultimate costs.

*Write for your copy of the Vulcan Shaker Chute Bulletin.*

## VULCAN IRON WORKS—Wilkes-Barre, Pa.

VULCAN of WILKES-BARRE
SHAKING CHUTES

# Winter is Here—Watch Your Ventilation

## CANTON AUTOMATIC MINE DOORS

**hold the air and direct it so the velocity is not impaired**

## A Canton Door in Time May Save Your Mine

***Increase Safety and Speed up Production at the Same time***

SURE TO OPEN

Opens automatically when trip approaches. Closes automatically after trip has passed.

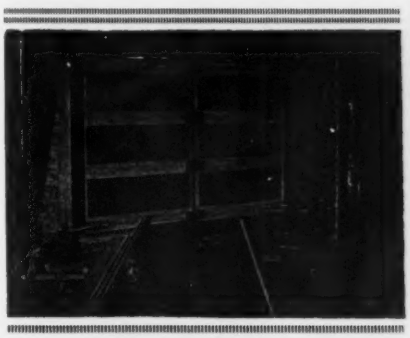
NO TRIP TOO FAST
NO LOST AIR

At 50 cents a day it does better work than any trapper from $2.00 to $7.00 per day.

OVER 5000 IN USE

CAN BE LEASED OR PURCHASED

WRITE US TODAY



SURE TO CLOSE

AMERICAN MINE DOOR COMPANY
2063 Dueber Ave. ~ Canton, Ohio

AUTOMATIC LABOR SAVING SAFETY EQUIPMENT

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
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**CAGES (Self-dumping)**
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**CALCINERS**
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**CALCIUM CARBIDE**
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**CARBON AND BORTZ**
Diamond Drill Carbon Co., World Bldg., New York.
R. S. Patrick, Sellwood Building, Duluth, Minn.

**CARBON FOR DIAMOND DRILLING**
Diamond Drill Carbon Co., World Bldg., New York.
R. S. Patrick, Sellwood Building, Duluth, Minn.
Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.

**CARBON BURNING APPARATUS**
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

**CARBON ELECTRODES (for Electric Furnaces and Electrolytic Work)**
National Carbon Co., Inc., Electrode Sales Division, 30 East 42nd St., New York City.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**CARBONS (for Arc Lamps, Blue Printing, Photographic)**
National Carbon Co., Inc., Cleveland, Ohio and San Francisco, Calif.

**CARBON RODS AND PASTE FOR WELDING**
Oxweld Acetylene Co., 30 E. 42nd St., New York City.
National Carbon Co., Inc., Cleveland, Ohio and San Francisco, Calif.

**CARBON SPECIALTIES (Circuit Breaker Contacts, Packing Rings, Filter Plates, Tubes, etc.)**
National Carbon Co., Inc., Cleveland, Ohio and San Francisco, Calif.

**CAR DERAILERS**
Johnson Wrecking Frog Co., Cleveland, Ohio.

**CAR DUMPERS, GRAVITY & POWER**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.
Phillips Mine & Mill Supply Co., Pittsburgh, Pa.
Roberts & Schaefer Co., Chicago, Ill.

**CAR DUMPERS (Rotary)**
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.
Phillips Mine & Mill Supply Co., Pittsburgh, Pa.
Roberts & Schaefer Co., Chicago, Ill.

**CAR FEEDERS**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.
Roberts & Schaefer Co., Chicago, Ill.

**CAR HAULS**
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Hockensmith Wheel & Mine Car Co., Penn, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

**CARNOTITE ORES**
O. Barlow Willmarth, Georgetown, Colo.

**CAR PULLERS**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

**CAR REPLACERS**
Johnson Wrecking Frog Co., Cleveland, Ohio.

**CAR RETARDERS**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.
Roberts & Schaefer Co., Chicago, Ill.

**CARS OF ALL DESCRIPTION**
American Car & Foundry Co., 30 Church St., New York City.
Hockensmith Wheel & Mine Car Co., Penn, Pa.

**CAR STOPS, AUTOMATIC & MANUAL**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Phillips Mine & Mill Supply Co., Pittsburgh, Pa.
Roberts & Schaefer Co., Chicago, Ill.

**CAR WIRE & CABLES**
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, N. J.

**CASTINGS**
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Timken Roller Bearing Co., Canton, Ohio.

**CASTINGS, GRAY IRON**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

**CASTINGS, OPEN HEARTH STEEL**
Vulcan Iron Works, Wilkes-Barre, Pa.

**CASTINGS (steel, iron)**
Vulcan Iron Works, Wilkes-Barre, Pa.

**CAST STEEL FROGS**
Central Frog & Switch Co., Cincinnati, Ohio.

**CHAINS**
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

**CHAINS, AUTOMOBILE ENGINE**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

**CHAINS, COAL CUTTING**
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

**CHAINS, DRIVE**
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

**CHAINS, FRONT END**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

**CHAIN LUBRICANTS**
Standard Oil Co. (Ind.), Chicago, Ill.

**CHAINS, OILING**
Morse Chain Co., Ithaca, N. Y.

**CHAINS, POWER TRANSMISSION**
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

**CHAINS, Silent (Bushed-Pin Joint)**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**CHAINS, SILENT (Rocker-Joint)**
Morse Chain Co., Ithaca, N. Y.

**CHAINS, SLING**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

**CHAINS, SPROCKET WHEEL**
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

**CIRCUIT-BREAKERS**
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**CLAMPS, GUARD RAIL**
Central Frog & Switch Co., Cincinnati, Ohio.

**CLAMPS (Mine)**
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**CLAMPS (Trolley)**
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**CLAMPS, WIRE ROPE**
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, N. J.

**CLIPS, WIRE ROPE**
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, N. J.

**CLOTH, WIRE**
Ludlow Saylor Wire Co., St. Louis, Mo.

**CLUTCHES**
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**COAL CLEANING MACHINERY**
American Coal Cleaning Corpn., Welch, W. Va.
American Rheolaveur Corporation, Wilkes-Barre, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

**COAL COMPANIES**
Lehigh Coal & Navigation Co., Philadelphia, Pa.
Thorne, Neale & Co., Philadelphia, Pa.

**COAL CONVEYING MACHINERY**
American Coal Cleaning Corpn., Welch, W. Va.
Conveyor Sales Co., 299 Broadway, New York City.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**COAL CRUSHERS**
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**COAL CRUSHERS & ROLLS**
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

**COAL CUTTERS**
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

**COAL HANDLING MACHINERY**
American Coal Cleaning Corpn., Welch, W. Va.
Conveyor Sales Co., 299 Broadway, New York City.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Joy Manufacturing Co., Franklin, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.
Roberts & Schaefer Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**COAL LOADERS**
Conveyor Sales Co., 299 Broadway, New York City.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Joy Manufacturing Co., Franklin, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.

**COAL MINING MACHINERY**
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**COAL MINING PLANTS**
American Coal Cleaning Corpn., Welch, W. Va.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

**COAL PREPARATION MACHINERY**
American Coal Cleaning Corpn., Welch, W. Va.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

**COAL SEPARATING MACHINERY**
W. S. Tyler Co., Cleveland, Ohio.

**COAL SEPARATORS (Pneumatic)**
American Coal Cleaning Corpn., Welch, W. Va.
Roberts & Schaefer Co., Chicago, Ill.

**COAL SEPARATORS (Spiralizers)**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**COAL TESTING EQUIPMENT**
W. S. Tyler Co., Cleveland, Ohio.

**COMPRESSORS, AIR**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.

**COMPRESSORS, MINE CAR**
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.

**CONCENTRATORS (Table)**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**CONCRETE REINFORCEMENT**
American Steel & Wire Co., Chicago, Ill., and New York.

**CONDENSERS**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**CONTROLLERS**
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**CONVERTERS, COPPER**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**CONVEYORS**
American Coal Cleaning Corpn., Welch, W. Va.
Conveyor Sales Co., 299 Broadway New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

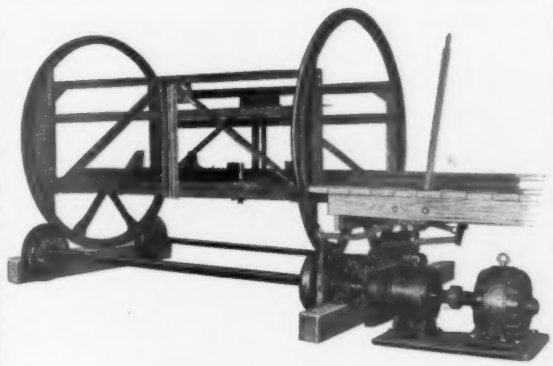
**CONVEYOR BEARINGS**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**CONVEYORS, BELT**
American Coal Cleaning Corpn., Welch, W. Va.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**CONVEYORS, CHAIN FLIGHT**
American Coal Cleaning Corpn., Welch, W. Va.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**CONVEYORS, COAL**
American Coal Cleaning Corpn., Welch, W. Va.
Conveyor Sales Co., 299 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

**CONVEYORS AND ELEVATORS**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Coal Cleaning Corpn., Welch, W. Va.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.



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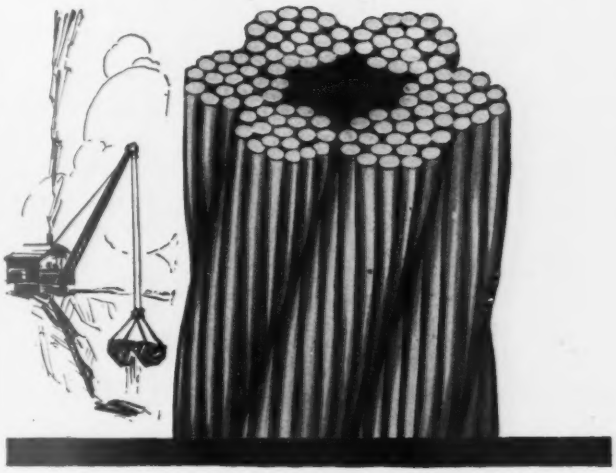

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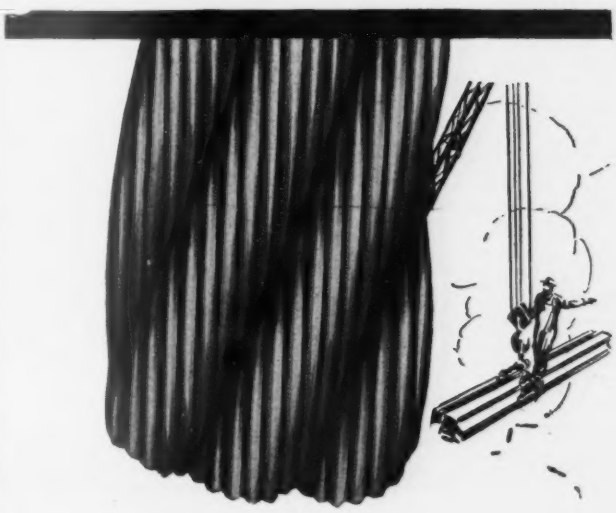

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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**COOLERS, ROTARY**
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Pennsylvania Drilling Co., Pittsburgh, Pa.

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Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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West Virginia Rail Co., Huntington, W. Va.

**CROSSOVERS**
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Sweet's Steel Co., Williamsport, Pa.

**CRUSHER OILS**
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**CRUSHERS**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Symons Bros. Co., Chicago, Ill.

**CRUSHERS, Coal**
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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

**CRUSHERS, SINGLE & DOUBLE ROLL**
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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**CRUSHING PLANTS, COKE**
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**CRYSTAL (Quartz)**
Diamond Drill Carbon Co., World Bldg., New York.

**CUP GREASE**
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Standard Oil Co. (Ind.), Chicago, Ill.

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**CYCLONE DUST COLLECTORS**
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**DECARBONIZING APPARATUS**
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American Rheolaveur Corporation, Wilkes-Barre, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

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Hercules Powder Co., Wilmington, Del.

**DIAMOND CORE DRILL CONTRACTING**
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Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

**DIAMOND DRILLING CARBON**
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R. S. Patrick, Sellwood Building, Duluth, Minn.

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R. S. Patrick, Sellwood Building, Duluth, Minn.

**DIAMONDS, INDUSTRIAL**
Diamond Drill Carbon Co., World Bldg., New York.
R. S. Patrick, Sellwood Building, Duluth, Minn.

**DIAMOND TOOLS**
Diamond Drill Carbon Co., World Bldg., New York.

**DIESEL ENGINE OILS**
Standard Oil Co. (Ind.), Chicago, Ill.

**DIGGERS & PICKS, Pneumatic**
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**DOORS, AUTOMATIC MINE**
American Mine Door Co., Canton, Ohio.

**DRIFTERS, DRILL**
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.

**DRILLERS' DIAMONDS**
Diamond Drill Carbon Co., World Bldg., New York.

**DRILLING CONTRACTORS**
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Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.

**DRILLING, DIAMONDS FOR**
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R. S. Patrick, Sellwood Building, Duluth, Minn.

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Ingersoll-Rand Co., 11 Broadway, New York City.
Keystone Churn Drill Co., Beaver Falls, Pa.

**DRILL BITS, Carbon (Diamonds) for**
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R. S. Patrick, Sellwood Building, Duluth, Minn.

**DRILL, CARBON (Diamonds) for**
Diamond Drill Carbon Co., World Bldg., New York.
R. S. Patrick, Sellwood Building, Duluth, Minn.

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Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.

**DRILL LUBRICANTS**
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**DRILLER'S DIAMONDS**
R. S. Patrick, Sellwood Building, Duluth, Minn.

**DRILLS, CORE**
Hoffman Bros. Drilling Co., Punxsutawney, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

**DRILLS, ELECTRIC**
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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
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Ingersoll-Rand Co., 11 Broadway, New York City.
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Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.

**DRILL STEEL SHARPENERS**
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Morse Chain Co., Ithaca, N. Y.

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Vulcan Iron Works, Wilkes-Barre, Pa.

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Link-Belt Co., 300 W. Pershing Rd. Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

**DRYERS, ROTARY**
Vulcan Iron Works, Wilkes-Barre, Pa.

**DUMP CARS**
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

**DUMPS (Rotary, Cradle, Crossover & Kickback)**
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Mining Safety Device Co., Bowerston, Ohio.
Phillips Mine & Mill Supply Co.,
Roberts & Schaefer Co., Chicago, Ill. Pittsburgh, Pa.

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**DUST FILTERS**
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General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
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**DYNAMO OILS**
Standard Oil Co. (Ind.), Chicago, Ill.

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General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
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Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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**ELEVATOR AND HOIST MOTORS**
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**ELEVATOR MACHINERY**
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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**ENGINE OILS**
Standard Oil Co. (Ind.), Chicago, Ill.

**ENGINES, GAS AND GASOLINE**
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Ingersoll-Rand Co., 11 Broadway, New York City.
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Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**ENGINES, OIL**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

**ENGINES, Steam**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

**EXCAVATORS**
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

**EXHAUSTERS**
American Coal Cleaning Corpn., Welch, W. Va.

**EXPLOSIVES**
du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., 934 King St. Wilmington, Del.

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Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**FANS, Man Cooling**
Robinson Ventilating Co., Zelienople, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**FANS, Turbine**
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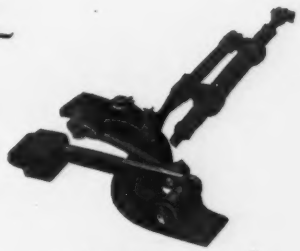

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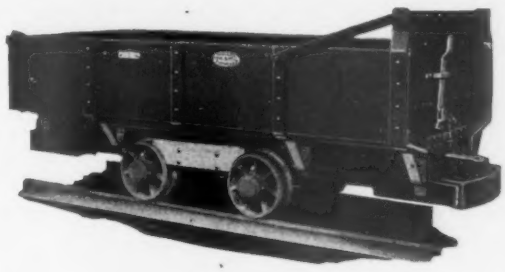

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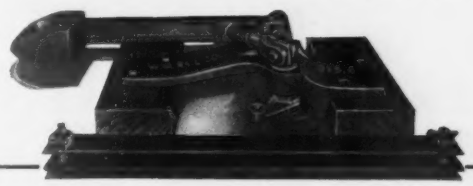

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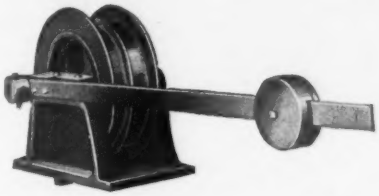

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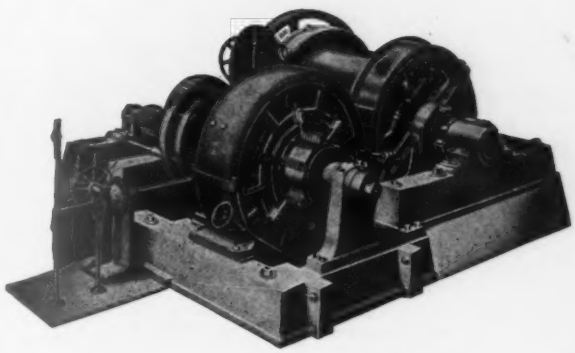

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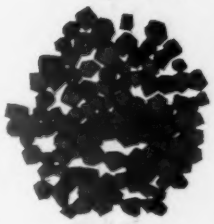

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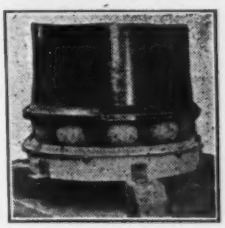

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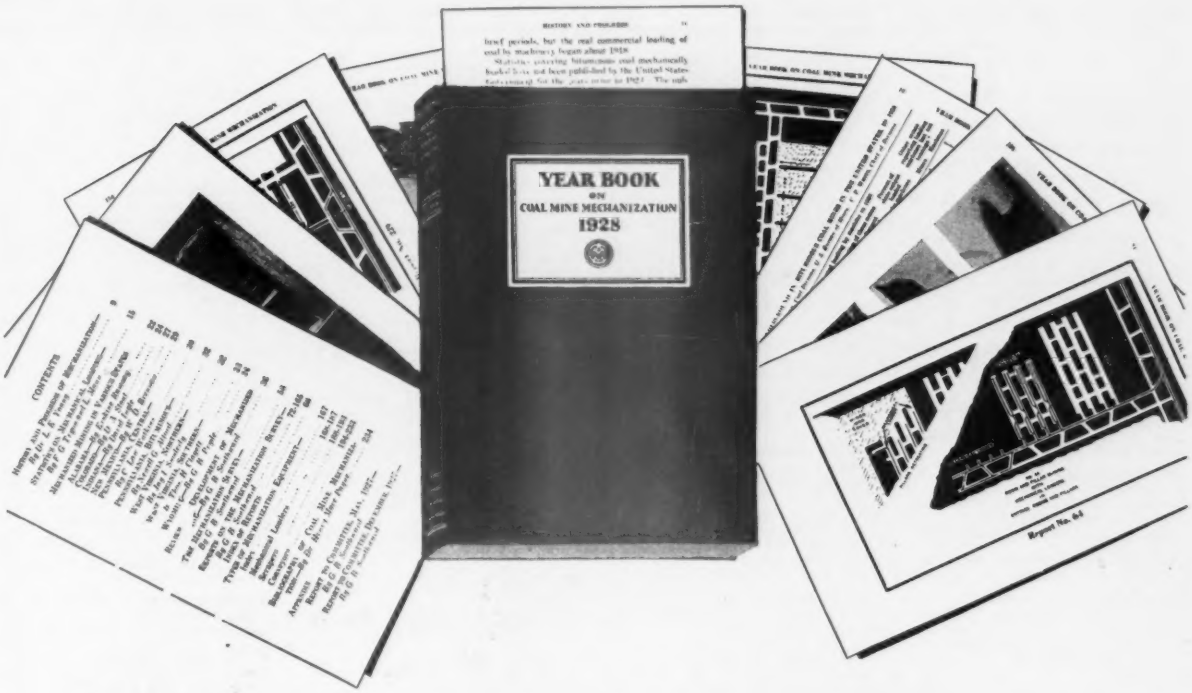


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Ralph A. Smith, Secretary-Treasurer, Pennsylvania Forest Products Manufacturing Assn., Tyrone, Pa.
D. A. Stout, Colorado Fuel & Iron Co., Pueblo, Colo.
R. D. Tonkin, Forester, Clearfield Bituminous Coal Corpn., Indiana, Pa.
W. D. Tyler, V. P., Clinchfield Coal Corpn., Dante, Va.

### Mine Drainage

SUB-COMMITTEE NO. 1—PUMPS FOR DEVELOPMENT WORK

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J. E. Holveck, Dist. Mgr., Aldrich Pump Co., 1209 Empire Bldg., Pittsburgh, Pa.
G. E. Huttle, Mech. Engr., H. O. Frick Coke Co., Scottdale, Pa.
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Cecil W. Smith, care Minnesota Northern Power Co., 831 Second Ave., So., Minneapolis, Minn.
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L. P. Crecelius, Engr., Cleveland & Western Coal Co., 1517 Union Trust Bldg., Cleveland, Ohio.
E. D. Knight, 2207 Washington St., Charleston, W. Va.
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SUB-COMMITTEE NO. 4—UNWATERING ABANDONED WORKINGS

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O. M. Pruitt, Pres., Indiana Air Pump Co., Indiana Pythian Bldg., Indianapolis, Ind.
Chas. A. Straw, Cons. Mech. Engr., Hudson Coal Co., 434 Wyoming Ave., Scranton, Pa.
G. V. Woody, Mgr., Allis-Chalmers Mfg. Co., Wilkes-Barre, Pa.

SUB-COMMITTEE NO. 5—MINE WATER AND ITS ACTION UPON MINE DRAINAGE EQUIPMENT

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Parker Cott, Coal Mine Equipment Co., 2218 Farmers Bank Bldg., Pittsburgh, Pa.
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T. W. Gray, Pittsburgh Coal Co., Library, Pa.
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W. H. Hinks, Engr., Imperial Coal Corpn., Johnstown, Pa.
R. E. Hobart, Mech. Supt., Lehigh Coal & Navigation Co., Lansford, Pa.
W. E. Housman, Research Engr., H. C. Frick Coke Co., Scottdale, Pa.
Wm. L. Jacobus, Chemist, Susquehanna Collieries Co., Wilkes-Barre, Pa.
G. G. Kanable, Engineering Dept., Rochester and Pittsburgh Coal and Iron Co., Indiana, Pa.
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Martin J. Lide, Cons. Engr., Woodward Bldg., Birmingham, Ala.
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L. D. Royer, Cons. Engr., Travis Bldg., San Antonio, Tex.
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M. E. Walthall, Elec. and Mech. Engr., Pennsylvania Coal Co., P. O. Box 553, Scranton, Pa.
P. A. Witherspoon, Chief Engineer, Carnegie Coal Co., Oliver Bldg., Pittsburgh, Pa.

### Manufacturers Cooperating

Allis-Chalmers Mfg. Co., Milwaukee, Wis. (W. M. White, Mgr. and Chf. Engr., Hydraulic Dept.)
Barrett, Haentjens & Co., Hazelton, Pa. (W. M. McKee, Inc., Pittsburgh representative, Oliver Bldg., Pittsburgh, Pa.)
Brown-Fayro Co., Johnstown, Pa. (H. V. Brown, Genl. Mgr.)
Dravo-Doyle Co., Dravo Bldg., Pittsburgh, Pa. (E. F. Austin, Secy.)
Duraloy Co., Pittsburgh, Pa. (C. P. Mills, Chf. Engr.)
Duriron Co., Inc., Dayton, Ohio. (W. E. Pratt.)
Fairbanks, Morse & Co., Chicago, Ill. (Lloyd Yost, Mgr., Research Div.)
Goulds Pumps, Inc., Seneca Falls, N. Y. (A. L. McHugh, Chf. Engr.)
Indiana Air Pump Company, 816 Indiana Pythian Bldg., Indianapolis, Ind. (O. M. Pruitt, Pres.)
International Nickel Co., 67 Wall St., New York City. (W. M. Corse, 810 18th St. N. W., Washington, D. C.
LaBour Company, Chicago Heights, Ill.
Merco Nordstrom Valve Co., Inc., 110 W. 40th St., New York City. (C. E. Brown.)
Ohio Steel Castings Co., 2284 Scranton Rd., Cleveland, Ohio. (F. E. Clark.)
Rumsey Pump Co., Ltd., Seneca Falls, N. Y. (R. R. Micks, Secy. and Treas.)
Westinghouse Elec. and Mfg. Co., E. Pittsburgh, Pa.

### Mining and Loading Equipment

L. E. Young, *Chairman*

SUB-COMMITTEE NO. 1—LOADERS

T. E. Jenkins (*Chairman*), Vice Pres., West Kentucky Coal Co., Sturgis, Ky.
Newell G. Alford, Cons. Engr., Howard N. Eavenson & Associates, Union Trust Bldg., Pittsburgh, Pa.
I. N. Bayless, Gen. Supt., Utah Fuel Co., Castle Gate, Utah.
Edw. Bottomley, Sheridan Wyoming Coal Co., Sheridan, Wyo.
Frank E. Cash, U. S. Bureau of Mines, New Federal Bldg., Birmingham, Ala.
Walter M. Dake, Consulting Engineer, Joy Mfg. Co., Franklin, Pa.
J. L. Goss, Sales Mgr., Bertrand P. Tracy Co., Pittsburgh, Pa.
T. W. Gray, Asst. Supt. of Electric Equipment, Pittsburgh Coal Co., Library, Pa.
Arthur C. Green, Mgr., Central District, Goodman Mfg. Co., Halsted St. & 48th Pl., Chicago, Ill.
G. W. Hay, Gen. Mgr., Elk Horn Coal Corpn., Inc., Wayland, Ky.
F. V. Hicks, Director of Mechanical Loading, Union Pacific Coal Co., Rock Springs, Wyo.
T. E. Jenkins, V. P., West Kentucky Coal Co., Sturgis, Ky.
N. D. Levin, Jeffrey Mfg. Co., Columbus, Ohio.
N. H. McClevey, Vice Pres. & Gen. Mgr., Pike County Coal Corpn., Petersburg, Ind.
Norton A. Newdick, Vice Pres., The Coloder Co., Inc., Columbus, Ohio.
C. B. Officer, Chf. Engr., Sullivan Machinery Co., 122 So. Michigan Ave., Chicago, Ill.
C. S. Oldroyd, Pres., Oldroyd Machine Co., Cincinnati, Ohio.
Alex Palmros, Link-Belt Co., Philadelphia, Pa.
Geo. Schultz, Gen. Supt., Liberty Fuel Co., Latuda, Utah.
E. A. Siemon, Asst. Gen. Supt., Hillman Coal & Coke Co., 1st National Bank Bldg., Pittsburgh, Pa.
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A. W. Dickinson, Union Pacific Coal Co., Rock Springs, Wyo.
Thos. G. Fear, Gen. Mgr., Operations, Consolidation Coal Co., Fairmont, W. Va.
E. B. Gellatly, Gellatly & Co., H. W. Oliver Bldg., Pittsburgh, Pa.
Chas. Gottschalk, Buckskin, Ind.
A. B. Jessup, Jeddo Highland Coal Co., Jeddo, Pa.
Glen A. Knox, Supt., Gunn-Quealy Coal Co., Gunn, Wyo.
E. F. Miller, Gen. Supt., Bertha-Consumers Coal Co., Rachel, W. Va.
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D. A. Stout, Colorado Fuel & Iron Co., Pueblo, Colo.
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A. W. Hesse, Chf. Mng. Engr., Buckeye Coal Co., Nemacolin, Pa.
M. C. Mitchell, Mgr., Sullivan Machinery Co., Rwy. Exchange Bldg., St. Louis, Mo.

### Outside Coal Handling Equipment

J. W. Bischoff, Gen. Supt., West Virginia Coal & Coke Co., Omar, W. Va.
W. G. Duncan, Jr., Supt., W. G. Duncan Coal Co., Greenville, Ky.
Geo. Watkins Evans, Coal Mng. Engr., L. C. Smith Bldg., Seattle, Wash.
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G. H. Morse, Genl. Supt., Republic Iron & Steel Co., Oliver Bldg., Pittsburgh, Pa.
H. F. Nash, Vice Pres. & Genl. Mgr. of Sales, Rocky Mountain Fuel Co., 501 Temple Court Bldg., Denver, Colo.
Warren R. Roberts, Pres., Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.
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C. R. Stahl, Asst. to Genl. Mgr., C. C. B. Smokeless Coal Co., Stotesbury, W. Va.
C. Law Watkins, Vice Pres., Pennsylvania Coal & Coke Corpn., Cresson, Pa.
F. W. Whiteside, Chf. Engr., Victor-American Fuel Co., Ernest & Cranmer Bldg., Denver, Colo.

### Mine Ventilation

A. W. Hesse, *Chairman*

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J. R. Robinson, Pres., Robinson Ventilating Co., Pittsburgh, Pa.
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### Underground Power Transmission

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### Underground Transportation

Fred Norman, *Chairman*

MAIN COMMITTEE

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J. B. Forrester, Mgr., Teton Coal Co., Sam, Teton Co., Idaho.
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C. E. Watts, Mech. Engr., Berwind White Coal Mining Co., Windber, Pa.

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W. C. Sanders, Rwy. Equipment Engr., Timken Roller Bearing Co., Canton, Ohio.
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SECTIONAL COMMITTEE ON TYPES OF HAND BRAKES

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SECTIONAL COMMITTEE ON MINE CAR WHEELS

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Geo. M. Crawford, Crawford Machinery Co., Bessemer Bldg., Pittsburgh, Pa.
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## METAL MINING BRANCH

Lucien Eaton, *Chairman*

### Underground Power Transmission and Power Equipment

F. L. Stone, *Chairman*

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L. D. Anderson, Chf. Engr., U. S. Smelting, Refining and Mining Co., Salt Lake City, Utah, representing the National Safety Council.
John B. Andrews, Secy., American Association for Labor Legislation, 131 E. 23rd St., New York.

## OFFICERS AND COMMITTEES, 1928 (Continued)

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F. C. Stanford, Elec. Engr., Cleveland Cliffs Iron Co., Ishpeming, Mich., representing the Lake Superior Mining Institute.
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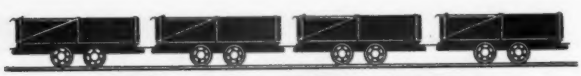

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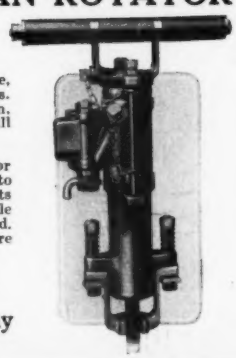

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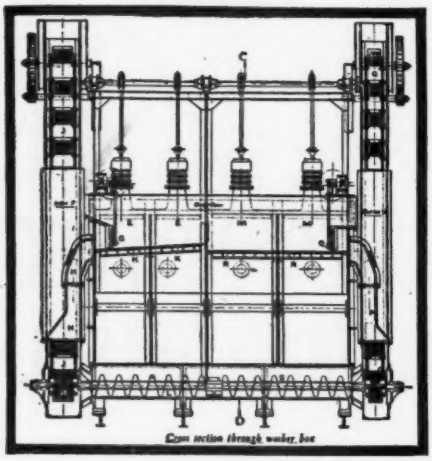

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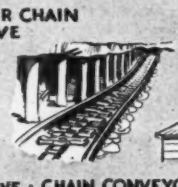
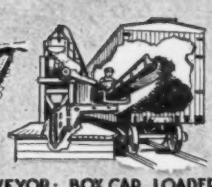
This is one fundamental improvement upon ordinary washing practice, embodied in this sytem. Mining men faced with problems of better coal preparation are urged to get the full details. Write for Bulletins.

3576

LINK-BELT COMPANY

300 W. Pershing Road CHICAGO





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# LINK-BELT
## SIMON-CARVES WASHERIES

# THREE LARGE PLANTS
## RECENTLY
# PUT IN OPERATION

## DESIGNED AND ERECTED BY US
## FROM GROUND TO TIPPLE TOP

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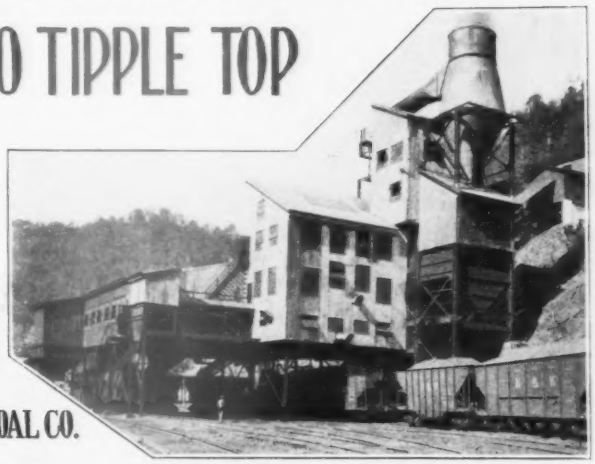
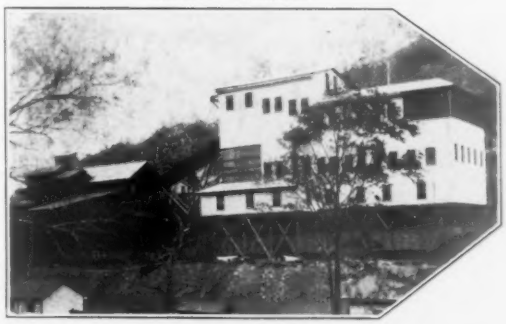
GILLIAM, W. VA.



**NEW RIVER & POCAHONTAS CONS. COAL CO.**
NEWHALL, W. VA.



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# *Phelps-Dodge uses MORSE CHAINS for important Drives*

*At top,* A partial view of the two big Nordberg 1,250 hp. Diesel engines with generator exciters driven by enclosed Morse Silent Chain at the main power plant of Old Dominion Co., Globe, Arizona.

*Above,* Several Alberger Dry Vacuum Pumps at Clifton Smelter, driven from 15 hp. Crocker-Wheeler Motors by Morse Silent Chains.

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